# Subbasin Assessment and Total Maximum Daily Loads of the North Fork Coeur d'Alene River (17010301)

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# List of Abbreviations, Acronyms, and Symbols

| | |
|---|---|
| 303(d) | Refers to section 303 subsection (d) of the Clean Water Act, or a list of impaired water bodies required by this section |
| ì | micro, one-one thousandth |
| AWS | agricultural water supply |
| BAG | Basin Advisory Group |
| BLM | United States Bureau of Land Management |
| BMP | best management practice |
| BURP | Beneficial Use Reconnaissance Program |
| C | Celsius |
| CFR | Code of Federal Regulations (refers to citations in the federal administrative rules) |
| cfs | cubic feet per second |
| CW | cold water |
| CWA | Clean Water Act |
| CWE | cumulative watershed effects |
| DEQ | Idaho Department of Environmental Quality |
| DO | dissolved oxygen |
| DWS | domestic water supply |
| EPA | United States Environmental Protection Agency |
| FPA | Idaho Forest Practices Act |
| GIS | Geographical Information Systems |
| HUC | Hydrologic Unit Code |
| IDAPA | Refers to citations of Idaho administrative rules |
| IDFG | Idaho Department of Fish and Game |
| IDL | Idaho Department of Lands |
| IDWR | Idaho Department of Water Resources |
| LA | load allocation |
| LC | load capacity |
| m | meter |
| $m^3$ | cubic meter |
| mi | mile |
| $mi^2$ | square miles |
| MBI | macroinvertebrate biotic index |
| mg/l | milligrams per liter |
| MOS | margin of safety |
| n.a. | not applicable |
| NA | not assessed |
| nd | no data (data not available) |
| PCR | primary contact recreation |
| ppm | part(s) per million |

| | |
|---|---|
| NFS | not fully supporting |
| NPDES | National Pollutant Discharge Elimination System |
| NRCS | Natural Resources Conservation Service |
| NTU | nephlometric turbidity unit |
| QA | quality assurance |
| QC | quality control |
| SBA | subbasin assessment |
| SCR | secondary contact recreation |
| SS | salmonid spawning |
| STATSGO | State Soil Geographic Database |
| TIN | total inorganic nitrogen |
| TKN | total Kjeldahl nitrogen |
| TMDL | total maximum daily load |
| TP | total phosphorus |
| t/yr | tons per year |
| U.S. | United States |
| USFS | United States Forest Service |
| USGS | United States Geological Survey |
| WAG | Watershed Advisory Group |
| WBAG | *Water Body Assessment Guidance* |
| WLA | waste load allocation |
| WQLS | water quality limited segment |
| WQS | water quality standard |

# 1. Executive Summary

The North Fork Coeur d'Alene River Subbasin is assessed. Eighteen water bodies are section 303(d) listed, while an additional sixteen were removed from the list between 1996 and 1998. Most water bodies have been listed for sediment. A few segments are listed for habitat and flow alteration. Prichard Creek and the East Fork Eagle Creek are listed for metals and pH. Prichard Creek is also listed for bacteria, dissolved oxygen, nutrients, and oil and grease

The subbasin assessment reviews the existing data for the streams. Bacteria, dissolved oxygen, plant growth nutrient, and oil and grease analyses of Prichard Creek water samples did not reveal any exceedances of state water quality standards and guidelines. Although pH was not found to exceed the standard in either East Fork Eagle or Prichard Creeks, the metals cadmium, lead, and zinc were found to exceed standards. Exceedances of these metals standards were also found in Beaver Creek. Sediment modeling was completed for the entire subbasin. Model results demonstrate that six of the seven subbasins of the watershed have sedimentation rates at or well in excess of 100% above background sedimentation rates. Sedimentation rates at or in excess of 100% of background are believed to be the point at which water quality is impaired. Pool volume and fish population data support the impairment determination. The exception is the Upper North Fork subbasin, which has lighter road densities and is 43% above background sedimentation rates. Pool volume and fish population data from streams of the Upper North Fork Subbasin indicate full support of the cold water and salmonid spawning uses.

The assessment finds that Prichard Creek is not exceeding bacteria, dissolved oxygen, nutrient, oil and grease, and pH standards and guidelines. It does not find an exceedance of the pH standard in East Fork Eagle Creek. The assessment recommends the delisting of East Fork Eagle Creek for pH and Prichard Creek for bacteria, dissolved oxygen, nutrient, oil and grease, and pH.

Habitat and flow alteration are not impacts amenable to development of total maximum daily load (TMDL) allocations. Segments of the North Fork Coeur d'Alene and Little North Fork Coeur d'Alene Rivers and Tepee, Prichard, East Fork Eagle Cougar and Steamboat Creeks are listed for either flow and or habitat alteration.

The assessment finds that Beaver, East Fork Eagle, and Prichard Creeks exceed dissolved cadmium, lead, and zinc standards. The assessment recommends that TMDLs be developed for these streams and metals. A metals TMDL addressing cadmium, lead, and zinc standards exceedances of East Fork Eagle Creek has been prepared. Since Beaver Creek is not listed for metals, it will be nominated for listed on the 2002 water quality limited (303(d)) list. The Beaver Creek TMDL will be deferred until the listing is complete. Insufficient metal load data is currently available to complete the metals TMDL for Prichard Creek. The Prichard Creek TMDL will be deferred until sufficient metals load data is developed (Table 1).

Sediment modeling and supporting information demonstrates a systemic sediment problem in the North Fork Coeur d'Alene watershed. Since the most downstream segments of the watershed are sediment impaired and all upstream watersheds contribute at least in part to the sediment load, the assessment recommends a subbasin-wide sediment TMDL. A sediment TMDL addressing the entire North Fork Coeur d'Alene River Subbasin has been prepared.

Table 1: Results of Water Body Assessment and TMDL Development Based on Application of the Available Data

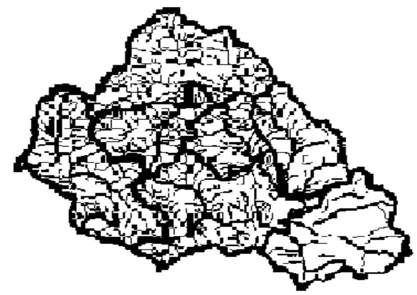
| Water Body Name and HUC[1] Number | Assessed Support Status | Reasons Segment to be Delisted for Pollutant | Reason TMDL[2] Deferred |
|---|---|---|---|
| North Fork Coeur d'Alene River 17010301 3482 | impaired by sediment | N/A[3] | N/A |
| Tepee Creek 17010301 3508 | impaired by sediment | N/A | N/A |
| Big Elk Creek 17010301 3511 | impaired by sediment | N/A | N/A |
| Calamity Creek 17010301 5034 | impaired by sediment | N/A | N/A |
| Cub Creek 17010301 5054 | impaired by sediment | N/A | N/A |
| Yellow Dog Creek 17010301 3506 | impaired by sediment | N/A | N/A |
| Shoshone Creek 17010301 3504 | impaired by sediment | N/A | N/A |
| Lost Creek 17010301 5643 | impaired by sediment | N/A | N/A |
| Falls Creek 17010301 7504 | impaired by sediment | N/A | N/A |
| Beaver Creek 17010301 3499 | impaired by metals | fish / residual pool volume data indicated full support for sediment | Water body must first be 303(d) listed for metals |
| Prichard Creek 17010301 3500 | impaired by sediment and metals | no evidence of bacteria, dissolved oxygen, nutrient, and oil and grease exceedances | Sufficient metals data not available; data expected end of water year 2001 |
| East Fork Eagle Creek 17010301 5617 | impaired by sediment and metals | no support for pH impairment | N/A |
| Cougar Gulch 17010301 7501 | impaired by sediment | N/A | N/A |
| North Fork Coeur d'Alene River 17010301 3481 | impaired by sediment | N/A | N/A |
| Steamboat Creek 17010301 3495 | impaired by sediment | N/A | N/A |
| Little North Fork Coeur d'Alene River 17010301 3485 | impaired by sediment | N/A | N/A |
| Copper Creek 17010301 3487 | impaired by sediment | N/A | N/A |
| Burnt Cabin Creek 17010301 5032 | impaired by sediment | N/A | N/A |

[1] Hydrologic Unit Code
[2] Total maximum daily load
[3] not applicable

# 2. North Fork Coeur d'Alene River (17010301) Subbasin Assessment

## 2.0 North Fork Coeur d’Alene River Subbasin Water Quality at a Glance

| | |
|---|---|
| *Hydrologic Unit Code.........................* | 17010301 |
| *Water Quality Limited Segments.........* | 18 segments |
| *Beneficial Uses Affected......................* | Cold Water Biota, Salmonid Spawning |
| *Pollutants of Concern.........................* | Sediment, Metals |
| *Known Land Uses.............................* | Forestry, Agriculture, Recreation |



## 2.1. Characterization of the Watershed

The North Fork Coeur d'Alene River[1] (North Fork) and its tributaries drain the entire Subbasin (17010301). The river and its tributaries flow from the Coeur d'Alene Mountains to the river’s confluence with the South Fork Coeur d'Alene River (South Fork) near Enaville, Idaho. This water quality assessment addresses the entire Subbasin (Figure 1). The watershed above the South Fork confluence encompasses approximately 895 square miles.

### 2.1.1. Physical and Biological Characteristics

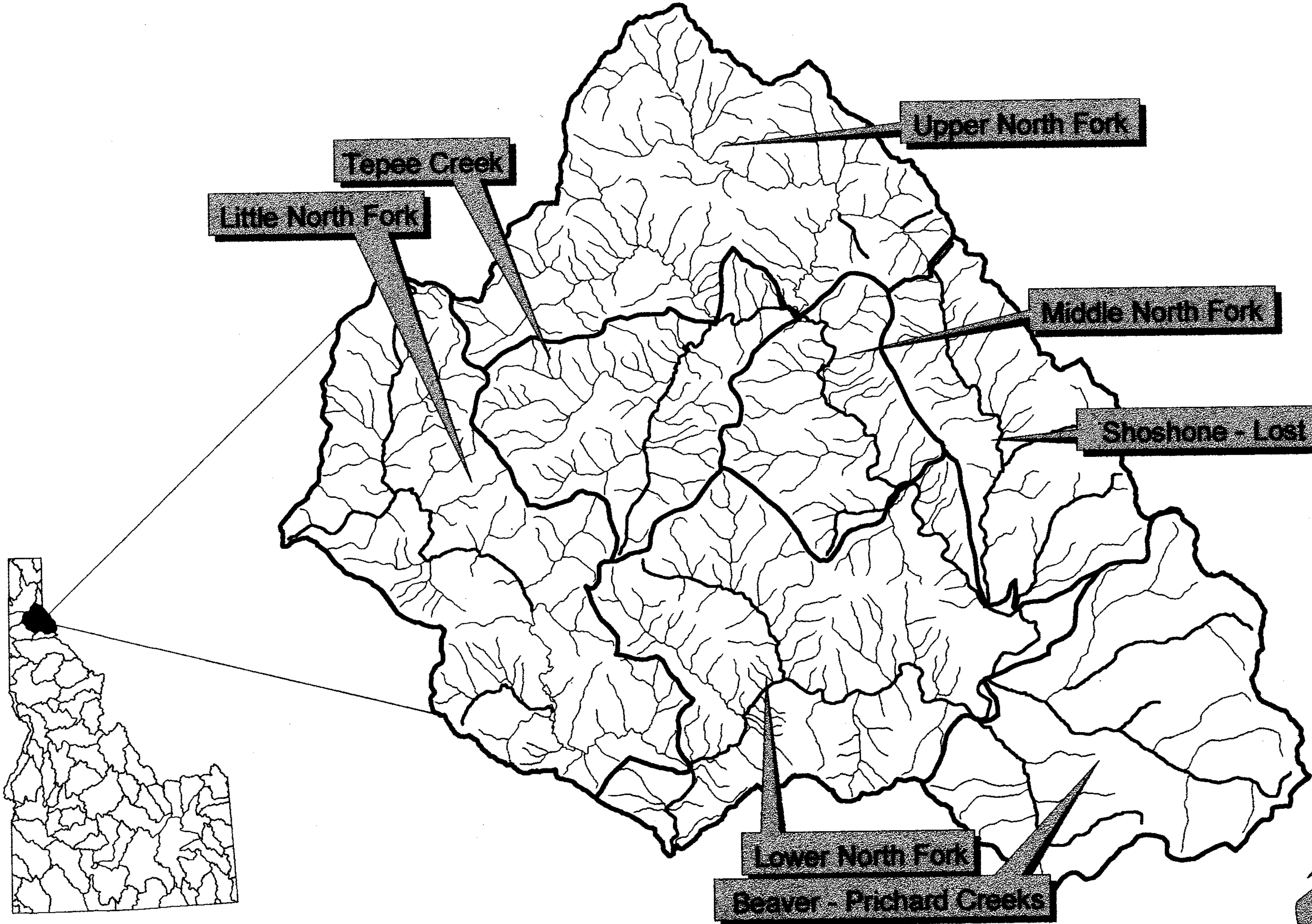
#### 2.1.1.1. Climate

Northern Idaho is located in the Northern Rocky Mountain physiographic region to the west of the Bitterroot Range. The Coeur d’Alene Mountains, which the North Fork drains, are a part of this range. The local climate is influenced by both Pacific maritime air masses from the west and continental air masses from Canada to the north. The annual weather cycle generally consists of cool to warm summers with cold and wet winters. The relative warmth of summers or winters depends on the dominance of the warmer, wetter Pacific or cooler, dryer continental air masses. Precipitation is greatest during the winter.

Although intervening mountain ranges progressively dry the Pacific maritime air masses, these air masses deposit appreciable moisture, primarily as snow, on the North Fork watershed. Maritime air masses can originate in the mid-Pacific. These air masses are relatively warm, often yielding their precipitation as rain. Relief of the watershed is generally between 3,000 and 5,000 feet above seas level. The majority of the watershed is in the rain on snow elevation range of 3,300 to 4,500 feet.

1. The Coeur d'Alene River above the South Fork Coeur d'Alene River was renamed the North Fork Coeur d'Alene River in 1991 (U.S. Board on Geographic Names, 1991).

# Figure 1. North Fork Coeur d'Alene River



Below 3,300 feet, the snow pack is transitory, while above 4,500 feet the snow pack is sufficiently cool that warming by a maritime front is insufficient to cause a significant thaw. In the rain on snow elevation range (3,300 - 4,500 feet), a warm and heavy snow pack accumulates each winter. A warm maritime front can sufficiently warm the snow pack, making it isothermal and capable of yielding large volumes of water during a runoff event.

### 2.1.1.2. Hydrology

The U.S. Geological Survey (USGS) has continuously operated the Enaville Gauging Station since October 1939 (58 years) and the Prichard Gauging Station since December 1950 (47 years). The average annual discharge hydrographs of the stations indicate that spring snowmelt dominates the pattern of stream discharge (Figure 2). Mean high flow discharge occurs in April. Mean high flow discharges are 5,227 and 2,108 cubic feet per second (cfs), respectively. Mean low flow discharge occur in September. Mean low flow discharges are 269 and 106 cfs, respectively. A more intermittent feature observed on individual yearly discharge hydrographs is rain on snow events, precipitated by the climate factors discussed earlier (Figure 3). These events occur between November and March; some years have several occurrences and others have none. Rain on snow conditions often result in large discharge (flood) events.

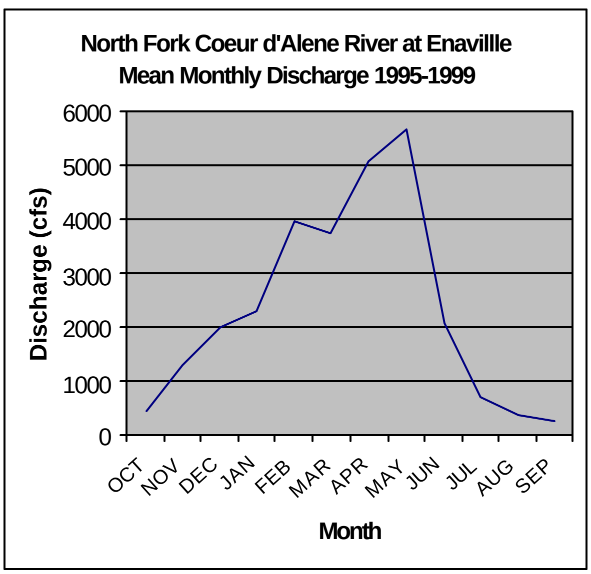



Figure 2: North Fork Coeur d'Alene River at Enaville, Idaho, Average Monthly Discharge (cubic feet per second) for water years 1995-1999 (USGS 1995-2000)

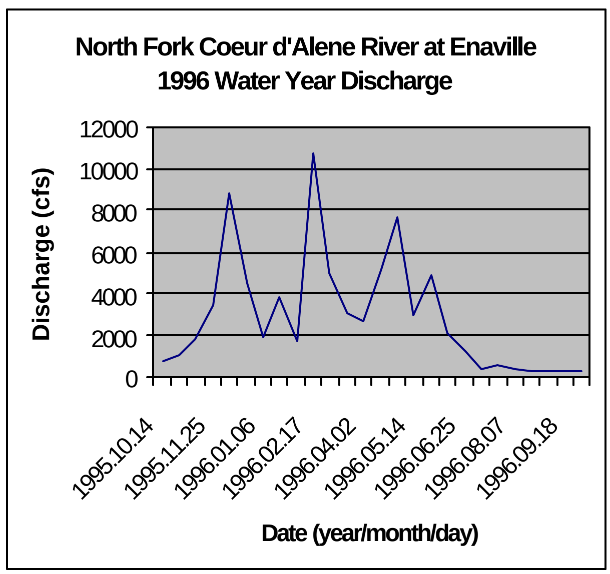



Figure 3: North Fork Coeur d'Alene River at Enaville, Idaho, Average Biweekly Discharge (cubic feet per second), for water year 1996 (USGS, 1997)

### 2.1.1.3. Land Forms, Geology, and Soils

The North Fork drains the Coeur d'Alene Mountains, a subset of the Bitterroot Mountains. The mountains are composed of metasedimentary rocks of the Proterozoic Belt Supergroup. High massive mountains and deep dissected intermountain valleys characterize the mountain range.

The valleys range down to 3,000 feet, while most mountains reach just over 5,000 feet. Only mountains on the Bitterroot Divide reach to over 6,000 feet. The land is steep but generally stable. Mass failures are not a typical feature of the landform development, but are specific to a few land types. These are typically glacial deposits located primarily in the valley bottoms. Valley bottoms are composed of colluvial deposits in the steep valleys and gulches. The valley bottoms in the broader floodplains of the North Fork below Tepee Creek and Beaver Creek are made of alluvial materials worked by these streams.

The mountain slopes are underlain by silty to silt loam podsolic soils developed under cool conditions. Volcanic ash deposits are variably found in the soil mantle. The soil mantle is generally thin on slopes with A and B horizons of 3 to 4 inches and generally decreases with altitude. Soils in the bottomlands can be silty to sandy podsols developed under upland forest. Near streams and in some pockets, black mucky soils exist where red cedar stands were the dominant vegetation.

#### 2.1.1.4. Vegetation

The mountain slopes are mantled with mixed coniferous forests of true fir, Douglas fir, larch, and pine. White pine, ponderosa pine, and western larch have been selectively removed from the forest, resulting in stands more susceptible to root rot diseases. Rivers and streams are flanked by riparian stands dominated by cottonwood at lower elevations and alder in the higher valleys. Prior to settlement, riparian forests dominated by western red cedar flanked the river and the lower reaches of its tributaries. Red cedar boles that fell into the streams were an important source of large organic debris (LOD). The boles provided pool habitat and sediment storage. Logging of the riparian cedar stands and removal of LOD in log drives has altered the aquatic habitat of the North Fork and its tributaries (Russell,1985). In the lower the North Fork valley, lands converted to pasture flank the river.

#### 2.1.1.5. Aquatic Fauna

The native salmonids of the subbasin’s streams are cutthroat trout, whitefish, and bull trout. Sculpin and shiners are non-salmonid natives. Tailed frogs, giant salamanders, and turtles complete the vertebrate species. The fish fauna of the river and some of its tributaries has been altered by the introduction of rainbow and brook trout as well as chinook salmon. Introduced fish have been able to establish themselves in some habitats at lower elevations, while higher elevation water bodies tend to retain the native trout. Although fish composition appears stable in the headwaters, fish abundance is generally believed to be lower than historic levels.

### 2.1.2. Cultural Impacts

Three small towns, Enaville, Prichard, and Murray, are located in the North Fork Subbasin. None of these has a population in excess of 50. Resident and seasonal population is sparse in the remainder of the watershed. Subdivision of pastures along the lower North Fork into summer recreational vehicle parks has increased summer occupancy in these areas in recent years. Summer cabin subdivisions near Prichard are another summer population center.

In the 573,695-acre watershed, management is divided into 536,605 acres of U.S. Forest Service (USFS) managed land (93.5%), 24,385 acres of private land (4.3%), 9,309 acres state managed land (1.6%), and 3,378 acres Bureau of Land Management (BLM) managed land (0.6%)(IDL GIS database). Private properties are primarily bottomland along the lower North Fork and small ranches of 40 to 160 acres. The bulk of the watershed is part of the Coeur d'Alene National Forest. The Magee area on Tepee Creek was once a small population center composed of a sawmill and a Forest Service work center.

Land use is primarily in forest management for multiple resource outputs (timber, grazing, water, and recreation). Recreational and retirement homes as well as recreational vehicle camps are located in bottomlands along the lower river. Nine recreation areas (primarily picnic areas and campgrounds) and three national recreational trails are located in the watershed. Minor grazing occurs throughout the watershed, but is centered in the lower river valley. A few mineral deposits have been located and have been developed throughout the watershed. Mineral development was relatively extensive in the Prichard and Beaver Creek sub-watersheds where primarily placer gold deposits were developed during the 1880s. A few underground gold mines were developed above Murray along Prichard Creek. Zinc and lead mines were developed as well. These include the Jack Waite Mine on the East Fork of Eagle Creek; the Crystal Lead Mine on the West Fork Eagle Creek; the Monarch, Paragon, Bear, Ione, and Terrible Edith Mines in Prichard Creek; and Carlisle Mine on Beaver Creek. The watershed has sustained appreciable timber harvest since the turn of the century. Loggers initially used the waterways as the log transport system. A system of log flumes, splash dams, and log drives was used to move logs to mills along the Coeur d’Alene River. The splash dams and log drives caused severe structural disruptions to the streams, including the removal of large organic debris. Railroad logging was practiced in the watershed. Railroad grades entered the Little North Fork, Shoshone Creek, and other sub-watersheds. Between the late 1930s and the 1980s, an extensive forest road network was installed in watersheds. Many of these roads were built in the stream bottoms, fundamentally altering stream gradient and stability. From the 1940s to the 1970s, timber harvest depended on an extensive road network. Logging with the early jammer systems necessitated roads at approximately 100yard intervals on the slopes. The result is a network of roads inventoried or forgotten that intercept the natural drainage system at numerous locations throughout its dendric pattern. Mid-century harvests also relied heavily on clear cut prescriptions. As a result, the watershed has had approximately 15.5% of its area harvested at least once (USFS GIS data base), mostly in the form of this by clear cuts.

## 2.2. Regulatory Requirements

### 2.2.1. Segments of Concern

The North Fork Coeur d’Alene River below the Jordan Creek confluence, and several of the stream segments, in its watershed are listed as water quality limited under section 303(d) of the Clean Water Act (CWA). Sediment is uniformly listed as the pollutant of concern. Some stream segments also have hydrologic modification and fish habitat degradation listed as concerns (Table 2). Fish density surveys (Hunt and Bjornn, 1993; Dunnigan and Bennett, unpublished data; Idaho Department of Environmental Quality (DEQ) Beneficial Use Reconnaissance

Program (DEQ, 1996) indicate that these factors have contributed to the decline of trout populations in the North Fork and its tributaries.

The North Fork Coeur d'Alene River Subbasin has eighteen water quality limited, 303(d) listed stream segments according to the 1998 303(d) list. These segments are listed, along with the reasons for listing, in Tables 2a-2f). The listed segments are mapped in Figures 1.

Table 2: Water Quality Limited Segments of the North Fork Coeur d'Alene River Subbasin

a) Water Quality Limited Segments of the Tepee Creek and Middle North Fork Coeur d'Alene River Sub-Watersheds

| **Stream** | **HUC[1] Number** | **Boundaries** | **Pollutants(s)** |
|---|---|---|---|
| North Fork | 17010301 3482 | Tepee Creek to Yellowdog Creek | sediment, flow and habitat alteration |
| Tepee Creek | 17010301 3508 | Headwaters to Big Elk Creek | sediment and habitat alteration |
| Big Elk Creek | 17010301 3511 | Headwaters to Tepee Creek | sediment |
| Calamity Creek | 17010301 5034 | Headwaters to Jordan Creek | sediment |
| Cub Creek | 17010301 5054 | Headwaters to Lost Fork | sediment |
| Yellowdog Creek | 17010301 3506 | Headwaters to North Fork Coeur d'Alene River | sediment |

1. Hydrologic Unit Code

b) Water Quality Limited Segments of the Shoshone-Lost Creek Sub-Watershed

| **Stream** | **HUC[1] Number** | **Boundaries** | **Pollutants(s)** |
|---|---|---|---|
| Shoshone Creek | 17010301 3504 | Sentinel Creek to North Fork Coeur d'Alene River | unknown |
| Lost Creek | 17010301 5643 | Headwaters to North Fork Coeur d'Alene River | sediment |
| Falls Creek | 17010301 7504 | Headwaters to Shoshone Creek | sediment |

1. Hydrologic Unit Code

c) Water Quality Limited Segments of the Prichard-Beaver Creeks Sub-Watershed

| **Stream** | **HUC[1] Number** | **Boundaries** | **Pollutants(s)** |
|---|---|---|---|
| Beaver Creek | 17010301 3499 | Headwaters to North Fork Coeur d'Alene River | sediment |
| Prichard Creek | 17010301 3500 | Barton Gulch to North Fork Coeur d'Alene River | bacteria, dissolved oxygen, habitat alteration, nutrients, oil and grease, sediment |
| East Fork Eagle Creek | 17010301 5617 | Headwaters to Eagle Creek | habitat alteration, metals, pH, sediment |
| Cougar Gulch | 17010301 7501 | Headwaters to Prichard Creek | sediment and habitat alteration |

1. Hydrologic Unit Code

d) Water Quality Limited Segments of the Lower North Fork Coeur d'Alene River Sub-Watershed.

| Stream | HUC[1] Number | Boundaries | Pollutants(s) |
|---|---|---|---|
| North Fork Coeur d'Alene River | 17010301 3481 | Yellowdog Creek to South Fork Coeur d'Alene River | sediment, flow, habitat alteration |
| Steamboat Creek | 17010301 3495 | Barrymore Creek to North Fork Coeur d'Alene River | sediment, flow, habitat alteration |

1. Hydrologic Unit Code

e) Water Quality Limited Segments of the Little North Fork Coeur d'Alene River Sub-Watershed.

| Stream | HUC[1] Number | Boundaries | Pollutants(s) |
|---|---|---|---|
| Little North Fork Coeur d'Alene River | 17010301 3485 | Headwaters to Laverne Creek | sediment, flow, habitat alteration |
| Copper Creek | 17010301 3487 | Headwaters to Lt. North Fork Coeur d'Alene River | sediment |
| Burnt Cabin Creek | 17010301 5032 | Headwaters to Little North Fork Coeur d'Alene River | sediment |

1. Hydrologic Unit Code

Additional water bodies had been listed on the 1996 list. These are listed in Tables 3a-3d. These water bodies were removed from the list when analysis of more recent water quality data provided macroinvertebrate biotic index scores sufficiently high for delisting (DEQ 1996). In one case, (Lost Creek) a segment was added to the list of water quality limited segments by this same assessment process.

Table 3: Water Bodies Found Supporting Beneficial Uses Based on 1998 Water Body Assessment

a) Tepee Creek and Middle North Fork Coeur d'Alene River Sub-Watersheds

| Stream | HUC[1] Number | Boundaries | Pollutant(s) |
|---|---|---|---|
| Cinnamon Creek | 17010301 5042 | Headwaters to North Fork Coeur d'Alene River | sediment |
| Flat Creek | 17010301 3507 | Headwaters to North Fork Coeur d'Alene River | sediment |
| Lost Fork Creek | 17010301 5115 | Headwaters to Jordan Creek | sediment |
| Trail Creek | 17010301 3510 | Headwaters to Tepee Creek | sediment |

1. Hydrologic Unit Code

b) Prichard-Beaver Creeks Sub-Watershed

| Stream | HUC[1] Number | Boundaries | Pollutants(s) |
|---|---|---|---|
| West Fork Eagle Creek | 17010301 3501 | Headwaters to Eagle Creek | sediment |
| Wesp Gulch | 17010301 7502 | Headwaters to Prichard Creek | sediment, habitat alteration |
| Tiger Gulch | 17010301 7500 | Headwaters to Prichard Creek | sediment |
| Ophir Gulch | 17010301 7500 | Headwaters to Prichard Creek | sediment, habitat alteration |
| Idaho Gulch | 17010301 7505 | Headwaters to Prichard Creek | sediment, habitat alteration |
| Barton Gulch | 17010301 5008 | Headwaters to Granite Gulch | sediment |

1. Hydrologic Unit Code

c) Lower North Fork Coeur d'Alene River Sub-Watershed

| Stream | HUC[1] Number | Boundaries | Pollutants(s) |
|---|---|---|---|
| Downey Creek | 17010301 3505 | Headwaters to North Fork Coeur d'Alene River | sediment |

1. Hydrologic Unit Code

d) Little North Fork Coeur d'Alene River Sub-Watershed

| Stream | HUC[1] Number | Boundaries | Pollutants(s) |
|---|---|---|---|
| Barney Creek | 17010301 5007 | Headwaters to Little North Fork Coeur d'Alene River | sediment |
| Skookum Creek | 17010301 3490 | Headwaters to Little North Fork Coeur d'Alene River | sediment |
| Leiberg Creek | 17010301 3489 | Headwaters to Little North Fork Coeur d'Alene River | sediment |
| Laverne Creek | 17010301 3488 | Headwaters to Little North Fork Coeur d'Alene River | sediment |
| Bumblebee Creek | 17010301 3486 | Headwaters to Little North Fork Coeur d'Alene River | sediment |

1. Hydrologic Unit Code

All North Fork Coeur d'Alene River watershed water quality limited segments that were listed in 1996 have been assessed using standard BURP methods (DEQ, 1996). The assessment data is based on physical, habitat, and biotic measurements. The results of this assessment are reflected in the 1998 303(d) list and Tables 2 and 3above.

Unlisted segments that contribute to listed segments, have watersheds greater than three square miles, and have significant road densities are probably contributing to the water quality limitations of the listed segments. Remedial actions will be necessary in the watersheds of these unlisted tributaries in order to address the water quality limitations of the 303(d) listed segments.

### 2.2.2. Beneficial Uses

The North Fork Coeur d'Alene River (Unit P-1, Yellowdog Creek to mouth; Unit P-13, Jordan Creek to Yellowdog Creek; Unit P-14, source to Jordan Creek) has legislatively designated beneficial uses of domestic water supply, salmonid spawning, cold water biota, primary contact recreation, and special resource water (IDAPA 58.01.02.08.). Beneficial uses have not been legislatively designated for most tributaries to the North Fork Coeur d'Alene River including most of the 303(d) listed segments. Prichard Creek and the Little North Fork Coeur d'Alene River are exceptions to this and do have designated beneficial uses. Prichard Creek (Unit P-4) is designated for domestic water supply, salmonid spawning, cold water biota, and primary contact recreation (IDAPA 58.01.02.08.). The Little North Fork Coeur d'Alene River (Unit P-30) is designated for domestic water supply, salmonid spawning, cold water biota, primary contact recreation, and special resource water (IDAPA 58.01.02.08.). All undesignated streams of the watershed are by default designated for cold water biota, and primary and/or secondary contact recreation (IDAPA 58.01.02.101.01.a.). Wildlife habitat (IDAPA 58.01.02.100.04.) and aesthetics (IDAPA 58.01.02.100.05.) are designated as beneficial uses of all the waters of the state (DEQ, 2000a).

### 2.2.3. Water Quality Criteria:

Water quality criteria supportive of the beneficial uses are stated in the *Idaho Water Quality Standards and Wastewater Treatment Requirements* (DEQ, 2000a). The criteria supporting the beneficial uses are outlined in Table 4. In addition to these criteria, cold water biota and salmonid spawning are supported by two narrative standards, addressing sediment and nutrients. The narrative sediment standard states:

*Sediment shall not exceed quantities specified in section 250 and 252 or, in the absence of specific sediment criteria, quantities which impair designated beneficial uses. Determinations of impairment shall be based on water quality monitoring and surveillance and the information utilized as described in subsection 350* (IDAPA 58.01.02.200.08).

The excess nutrients standard states:

*Surface waters of the state shall be free from excess nutrients that can cause visible slime growths or other aquatic growths impairing designated beneficial uses* (IDAPA 58.01.02.200.06).

Table 4: Water Quality Criteria Supportive of Beneficial Uses (IDAPA 58.01.02.250)

| Designated Use | Primary Contact Recreation Standards | Secondary Contact Recreation Standards | Cold Water Biota Standards | Salmonid Spawning Standards |
|---|---|---|---|---|
| *Escherichia coli* and pH | 406 EC[1]/100mL[2] | 576 EC/100mL | pH between 6.5 and 9.5 | pH between 6.5 and 9.5 |
| *Escherichia coli* and dissolved gas | 126 EC/100mL geometric mean over 30days | 126 EC/100mL geometric mean over 30 days | dissolved gas not exceeding 110% | dissolved gas not exceeding 110% |
| chlorine | No applicable standard | No applicable standard | total chlorine residual less than 19 ug/L[3]/hr[4] or an average 11 ug/L/4 day period | total chlorine residual less than 19 ug/L/hr or an average 11 ug/L/4 day period |
| toxics substances | No applicable standard | No applicable standard | less than toxic substances set forth in 40 CFR[5] 131.36(b)(1) Columns B1, B2, D2 | less than toxic substances set forth in 40 CFR 131.36(b)(1) Columns B1, B2, D2 |
| dissolved oxygen | No applicable standard | No applicable standard | exceeding 6 mg/L D.O.[6] | exceeding 5 mg/L intergraval DO; exceeding 6 mg/L surface |
| temperature | No applicable standard | No applicable standard | less than 22 $^{o}$C[7] (72$^{o}$F[8]) instantaneous; 19 $^{o}$C (66$^{o}$F) daily average | less than 13 $^{o}$C (55$^{o}$F) instantaneous; 9$^{o}$C (48$^{o}$F) daily average |
| ammonia | No applicable standard | No applicable standard | low ammonia (formula/tables for exact concentration) | low ammonia (formula/tables for exact concentration) |
| turbidity | No applicable standard | No applicable standard | less than 50 NTU[9] instantaneous; 25 NTU over 10 days greater than background[10] | No applicable standard |

1. *Escherichia coli*
2. milliliters
3. micrograms
4. hours
5. code of federal regulations
6. dissolved oxygen
7. centigrade
8. Fahrenheit
9. Neplometric turbidity units
10. The turbidity standard is a standard applied to the mixing zones of point discharges in the standards (IDAPA 58.01.02.250.01.d.) However, the standard is technically based on the ability of salmonids to sight feed. This it is applicable through the narrative sediment standard (IDAPA.0.02.200.08) to impacts on salmonids (cold water biota) wherever these may occur.

## 2.3. Water Quality Concerns and Status

### 2.3.1. Pollutants Sources

The water bodies listed in the Subbasin have reported pollutant exceedances for one or more of the following pollutants: bacteria, dissolved oxygen, flow alteration, habitat alteration, metals, nutrients, oil and grease, pH, and sediment.

With the exception of sediment, flow alteration, and habitat alteration, the pollutants are listed for Prichard Creek (bacteria, dissolved oxygen, nutrients, and oil and grease) and its tributary, the East Fork of Eagle Creek (pH and metals). Bacterial and nutrient contamination come predominantly from human sources in the Prichard Creek watershed. Livestock grazing is minimal in the watershed. Dissolved oxygen standard exceedances are not expected given the gradient of the stream and its mountain valley setting. The oil and grease concern is related to the Yellowstone gasoline pipeline that passes over Thompson Pass and down the Prichard Creek watershed. The pipeline traverses the North Fork valley from the Prichard Creek confluence to its confluence with the South Fork. Although the pipeline poses a potential threat to the water quality of Prichard Creek and the North Fork, the last gasoline release was in 1973. Current Region 10 U.S. Environmental Protection Agency (EPA) policy is that “threatened” water bodies are those where a downward water quality trend is expected to result in water quality exceedances in the next listing period, which is two years (EPA,1995). The presence of the pipeline does not cause the water bodies to meet this guideline. The metals listing for Prichard Creek is related to the numerous mines and mills in its watershed. The pH and metals listing of East Fork Eagle Creek are related to metals discharge from the Jack Waite mining complex in its headwaters (Tributary Creek). Metals exceedances are possible from these sources. Exceedances of the pH criterion are not typically observed in the Coeur d’Alene Basin in-stream. (DEQ, 1997)

Flow alteration is listed for several of the larger streams of the Subbasin. This alteration is believed by some to be a change in the magnitude of flood flows as a result of vegetation manipulation in the watershed. Habitat alteration can occur from several actions, including road construction, removal of riparian vegetation, channelization, or excess sedimentation. Sediment is a water constituent naturally yielded by watersheds to water bodies. Excess sedimentation in a forested watershed like the North Fork most often has its origin in roads developed for logging or access to a watershed or improper forest harvest practices. Roads may yield sediment directly from their surfaces or beds through mass wasting, or the location of the road may cause the adjacent stream to begin bank cutting. Improper harvest practices include skidding logs on steep slopes or in stream corridors. The Beaver and Prichard sub-watersheds have added sedimentation that is the result of dredge, hydraulic, and underground mining with its associated development.

### 2.3.2. Available Water Quality Data

### 2.3.2.1 Stream Discharge Data

The USGS has continuously operated gauging stations near Enaville and Prichard, above the Shoshone Creek confluence, since October 1939 and December 1950, respectively. A discharge hydrograph based on the mean monthly discharge for the past five years is provided in Figure 2. The flood frequency of the Subbasin as a whole can also be developed from a more extensive review of the data from the Coeur d'Alene River gauging stations.

#### 2.3.2.1.1. Flood Magnitude and Frequency

After the floods that occurred during February 1996 in northern Idaho, there has been much discussion centered on the magnitude and frequency of flood events in the Coeur d'Alene Basin. Heavy rainfall, combined with warm winds, contributed to rapid snowmelt of a significant snow pack leading to the February 1996 floods. These floods were the second worst on record at several gauging stations in the Coeur d'Alene River Basin and the third worst based on the Post Falls USGS gauge and historical data.

The USGS operates several stream discharge gauging stations on the North Fork at Enaville; the South Fork at Pinehurst; and the Coeur d'Alene River at Cataldo, Rose Lake, and Harrison. The period of record for these stations ranges from less than ten years at Rose Lake and Harrison to more than fifty years at the Enaville and Cataldo gauge sites. The following table (Table 5) reflects the flood frequency data, which was computed by fitting the log Pearson Type III frequency distribution to the data collected through 1996 (U.S. Interagency Advisory Committee on Water Data, 1982).

Table 5: Magnitude and Frequency of Historical Flood Peaks at Selected Gauging Stations of the Coeur d'Alene River, Idaho (Brackson et. al., 1996)

| Gauging Station | February 1996 Flood Peak ($ft^3/S^3$) | 100 Year Flood Peak ($ft^3/S$) | Years of Gauging Record | Date and Magnitude of Historical Flood Peak ($ft^3/S$) |
|---|---|---|---|---|
| North Fork Coeur d'Alene River, Enaville | 56,600 | 58,400 | 57 | January 16, 1974<br>61,000 |
| South Fork Coeur d'Alene River, Pinehurst | 11,700 | _____[2] | 9 | Not operating during historic flood peak |
| Coeur d'Alene River, Cataldo | 68,300 | 70,800 | 63 | January 16, 1974<br>79,000 |
| Coeur d'Alene River, Rose Lake | 50,500[1] | _____[2] | 7 | Not operating during historic flood peak |
| Coeur d'Alene River, Harrison | 47,700[1] | _____[2] | 7 | Not operating during historic flood peak |

[1]. Mean daily flow for February 9, 1996, as computed using hydraulic model that simulates unsteady open channel flow in the low gradient reach of the Coeur d'Alene River which is influenced by the level of Coeur d'Alene Lake, where no relation exists between river stage and flow.
[2] Unable to calculate because of an insufficient record.
[3] Cubic feet per second

Table 5 indicates that the magnitude of the February 1996 flood event on the Coeur d'Alene River Basin was less than the 100-year peak and the historical flood peaks of January 1974. The 100-year flood has a one percent probability of occurring in any given year.

This information clearly indicates that the recurrence interval of large flood events on the Coeur d'Alene River Basin has not increased during the period of record. It helps to dispel the claims of large floods occurring on an annual basis. Both the large flood events of January 1974 and February 1996 were enhanced by above normal precipitation and saturated or frozen soil conditions.

No data is available for the high discharge event of 1933 for the Coeur d'Alene River. However, records for the Post Falls gauge that has operated since 1912 indicate that it reached its peak discharge of record on December 25, 1933, at 50,100 cfs. By comparison, the Post Falls gauge reached 38,600 cfs during the high discharge event of February 1996.

The flood frequency analysis and history indicate that high discharge events occur at 10 to 15-year intervals. This frequency has not accelerated in the mid-part of the twentieth century. The historical record indicates the 1933 high discharge event was the largest of record, while the 1974 and 1996 events were the second and third largest of record. Timber harvest by clear cut began in earnest in the 1940s, accelerated in the 1950s, 1960s, and 1970s, and decelerated in the 1980s after implementation of the National Forest Management Act curtailed the practice. If timber harvest by clear cut increased discharge on a large watershed basis, the 1974 or the 1996 events would be expected to be the largest of record, not the 1933 event. The flood frequency and history based on the USGS gauges and historical photos do not support the contention that timber harvest has increased discharge frequency or magnitude on a whole watershed basis.

It is possible that discharge has been increased by clear cut harvest in the first or even second order tributaries. These small watersheds would be most susceptible to discharge increases due to vegetation manipulation. Little gauging evidence has been collected to support this supposition. Some data was collected in the first and second order tributaries as part of the Coeur d'Alene River Basin Study (Soil Conservation Service, 1994). These data can be interpreted to indicate that the discharge hydrograph of upper Elk Creek (harvested) exhibited discharges with higher peaks for shorter duration than Halsey Creek (not harvested). The effect is soon lost in the de-synchronization caused by the many discharges from watersheds of different elevations and aspects that comprise a large watershed like the North Fork. Information exists that indicates that discharge modification in the first and second order tributaries might cause localized severe erosion. It is unlikely this is a widespread factor in stream sedimentation.

#### 2.3.2.2. Water Column Chemistry Data

Some water column chemistry data was collected in water years 1993 and 1994. The data addresses trace (heavy) metals, temperature, and specific conductance (USGS, 1993; USGS, 1994). Water temperatures indicate a stream that would support cold water biota and salmonid spawning. Trace metals are at very low concentrations near the Shoshone Work Center on the North Fork and slightly higher, but generally low and below Idaho standards, at Enaville below the Prichard Creek and Beaver Creek confluences. The metals have an origin in the Prichard and Beaver Creek watersheds where several gold and lead-zinc mines and mills are located

(Appendix A). Suspended solids data indicate a stream that generally has low suspended solid loads except during high discharge periods. Specific conductance that can be most closely correlated with total suspended solids, indicate a stream that generally has low suspended solid loads except during high discharge periods.

Samples of *Escherichia coli* (E-coli) in the lower North Fork Coeur d'Alene River during summer 2000 did not show any exceedances of the state standard. Less than one to four colonies per 100 milliliters were detected (DEQ, 2000a, unpublished data; Appendix B).

Samples were collected during high and low discharge conditions to assess the presence of oil and grease, nutrients, and bacteria in Prichard Creek. Oil and grease were not detected in any of these samples (Appendix B). Total phosphorous concentrations of Prichard Creek averaged 84.5 micrograms per liter (ug/L). A total phosphorous concentration limit of 100 ug/L is normally applied for nuisance weed growth in streams (EPA,1972). The nitrite-nitrate concentration of Prichard Creek is 21 ug/L, which is well below the guideline for excess nitrate, which is 300 ug/L as nitrogen (Sawyer, 1947; Müller, 1953). Water samples assessed for E-coli were either at non-detection levels or one E. Coli per 100 ml. These levels are well below the standard cited in Table 4. Dissolved oxygen measured during summer low discharge at several locations averaged 11.7 mg/L. This level is consistent with a rapidly flowing mountain stream and is well above the standard of 6 mg/L. Based on these data, Prichard Creek is not limited by oil and grease, nutrients, dissolved oxygen, or bacteria. Prichard Creek should be delisted for these pollutants.

**2.3.2.2.1. Metals Data**

**2.3.2.2.1.1. Metals Concentrations**

The waters of the Beaver and Prichard Creek watersheds have been assessed for metals concentration by several agencies and their contractors (Appendix A). The data are represented in Figure 4 (S. Box, Personal Communication). Zinc concentrations are used to illustrate the stream reaches where the chronic zinc standard is exceeded based on a water hardness of 25 milligrams per liter (mg/L) calcium carbonate ($CaCO_3$). The standard is exceeded over the entire reach of the East Fork Eagle Creek below the Tributary Creek confluence. Prichard Creek exceeds the standard from the vicinity of the Sullivan town site to the confluence with Eagle Creek. Wesp and Bear Gulches, tributaries to the creek, exceed the standard. Beaver Creek exceeds the standards from the vicinity of the Carbon Center town site to its mouth. The exceedances are diluted in the down stream direction in all cases, indicating that relatively few sources on each stream cause the exceedances. Although metals reach the North Fork, metals exceedances are not observed. Metals standards for cadmium, copper, and lead are also exceeded in the water samples analyzed. Cadmium, copper, and lead reflect a similar pattern to zinc, but concentrations decline more rapidly. Copper is not present above the standard in Beaver Creek. There were no instances of arsenate exceedances found in any of the creeks. Two mercury exceedances were found. These could be localized mercury contamination from the use mercury as an amalgam of gold. The database (Appendix A) indicates several pH values lower than 6.5, but these are mine portal adit discharges. Data collected to date in East Fork Eagle and Beaver Creeks indicate a pH range between 6.8 and 7.8. These data indicate that the East Fork Eagle Creek is not limited by pH.

DEQ found exceedances of cadmium, lead, and zinc standards in East Fork Eagle Creek. The cadmium standard was not exceeded in seven of thirteen samplings. The lead standard was not exceeded in two cases of thirteen samplings, while zinc exceeded the standard in every case. Monitoring of Beaver Creek showed exceedances of the cadmium, lead, and zinc standards. The but these are mine portal adit discharges. Data collected to date in East Fork Eagle and Beaver standards in every case. The USGS monitored Prichard Creek at Prichard. Several zinc standard violations were found, while cadmium and lead violations were not recorded. The Prichard Station is downstream of the Eagle Creek confluence and poorly situated to resolve standards violations in Prichard Creek.

#### 2.3.2.2.1.2 Stream Discharge Analysis of Beaver, East Fork Eagle, and Prichard Creeks

The seasonal stream discharges of the metals-impaired streams were developed based on the extensive period of record at the Silverton Gauge Station on the South Fork. The discharge at Silverton station has a strong correlation ($r^2$=0.797) with the Prichard Station at Prichard (Appendix A). Correlations of the Silverton discharge with measured discharges of the East Fork Eagle Creek at the Eagle Road Bridge ($r^2$= 0.909) and Beaver Creek at the Carbon Center Bridge ($r^2$= 0.834) are strong. Based on these relationships, a water yield per watershed acre above each stream gauging site was developed for 7Q10, 10th, 50$^{th}$, and 90th percentile flows. These flows represent extremely low, moderately low, average and moderately high flows, respectively. The resultant estimated flows are provided in Table 6.

Table 6: Projected Discharges at the Points of Compliance from Beaver, East Fork Eagle, and Prichard Creeks

| Stream and Point of Compliance | 7Q10 Flow (cfs)[1] | 10th Percentile Flow (cfs) | 50th Percentile Flow (cfs) | 90th Percentile Flow (cfs) |
|---|---|---|---|---|
| Beaver Creek at Carbon Center Bridge | 2.3 | 3.5 | 8.0 | 47.5 |
| East Fork Eagle Creek at Eagle Road Bridge | 6.7 | 10.4 | 23.5 | 140.1 |
| Prichard Creek at Murrey Bridge | 12.6 | 19.5 | 44.2 | 263.2 |

1. cubic feet per second

#### 2.3.2.2.1.3 Hardness Relation to Stream Discharge

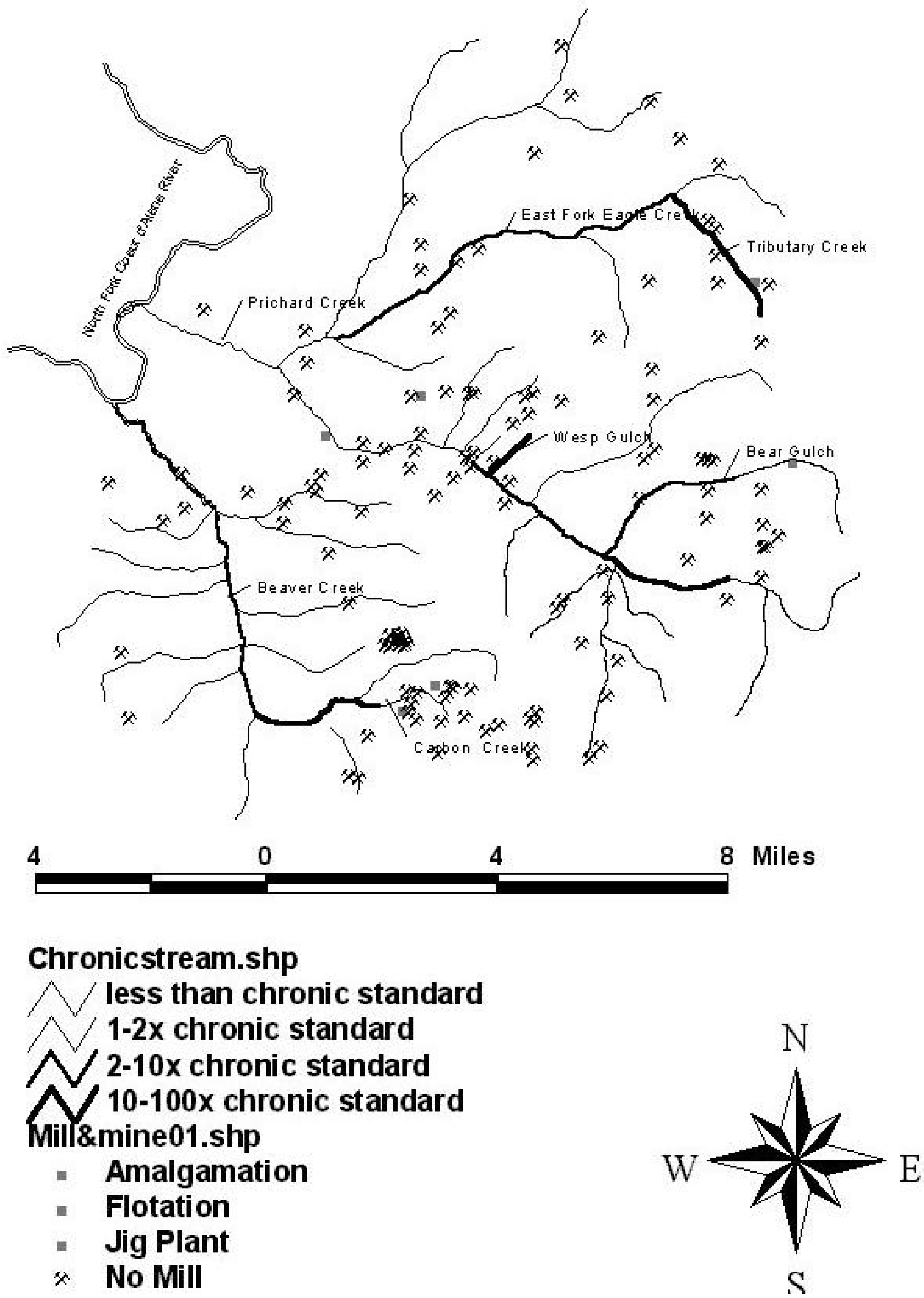
Relationships between stream hardness (milligrams $CaCO_3$ per liter) and stream discharge were developed for the Coeur d'Alene River system (EPA-DEQ, 2000). Similar relationships were developed for the metals-impaired streams of the North Fork (Appendix A). East Fork Eagle and Prichard Creeks did not have hardness values that exceeded 25 mg/L $CaCO_3$. These streams will have metals goals set at the lower threshold of hardness that is 25 mg/L $CaCO_3$. Beaver Creek has hardness values at low discharge that exceed 25 mg/L $CaCO_3$. The relationship has an $r^2$ value of 0.79. Based on this relationship, the hardness at the discharges defined in Table 7 was developed for Beaver Creek.

Table 7: Hardness (mg/L $CaCO_3$) of Beaver Creek at Discharge Levels

| Stream and Point of Compliance | 7Q10 Hardness | 10th Percentile Hardness | 50th Percentile Hardness | 90th Percentile Hardness |
|---|---|---|---|---|
| Beaver Creek at Carbon Center Bridge | 32.2 | 31.3 | 28.6 | 20 |

Note: EF Eagle and Prichard Creeks have not exhibited hardness values in excess of 25 mg/L $CaCO_3$.

# Figure 4: Zinc Concentration in Water of Prichard and Beaver Creeks



### 2.3.2.2.1.4 Metals Loads

One water year's (2000) of metals concentrations and load data was collected for sites on Beaver Creek, East Fork Eagle Creek, and Prichard Creek The measured metals loads of cadmium, lead, and zinc at four flow tiers is provided in Table 8. Values for Prichard Creek will not be available until the end of water year 2001.

Table 8: Mean of Dissolved Cadmium (Cd), Lead (Pb), and Zinc (Zn) Loads of Beaver and East Fork Eagle, Creeks in Discharge Categories

| Stream and Point of Compliance | <7Q10 to 10th Cd Pb Zn (pounds per day) | 10th to 50th Cd Pb Zn (pounds per day) | 50th to 90th Cd Pb Zn (pounds per day) | 90th plus Cd Pb Zn (pounds per day) |
|---|---|---|---|---|
| Beaver Creek at Carbon Center Bridge | **0.02 0.02 3.1 n = 3** | **0.07 0.09 15.2 n = 3** | **0.24 0.19 50.9 n = 6** | **1.10 3.60 166.3 n = 1** |
| East Fork Eagle Creek at Eagle Road Bridge | **0.01 0.04 2.4 n =4** | **0.03 0.20 7.3 n = 3** | **0.31 1.08 27.3 n = 3** | **1.72 5.50 105.7 n = 2** |

### 2.3.2.2.1.5 Metals Background

The issue of natural mineralization was addressed in the Coeur d'Alene Basin metals TMDL and in the Natural Resource Damage Assessment process. Technical analyses of 40 sites in the mineralized zone of the Silver Valley demonstrate that metals background in water is somewhat higher than non-mineralized zones, but well below the metals standards (EPA-DEQ, 2000). Similar levels of background metals are expected in the Prichard and Beaver Creek watersheds.

### 2.3.2.2.1.6 Discrete Discharges of Metals

The point discharge sources of the metals cadmium, lead, and zinc are listed in Table 7. In every case, the adit discharges exceed the cadmium, lead, and zinc standards. The daily load of each source was calculated based on estimates discharge weighted for seasonal flow (Appendix A). The discharge patterns of these adits are assumed to be similar to that of the Gem adit. In the case of the Jack Waite adit, additional discharge data was available (McCulley, Frick, and Gilman, 2001). The total load from point discharges is estimated as 0.008 pounds cadmium per day, 0.1 pounds lead per day, and 2.1 pounds zinc per day to the East Fork Eagle Creek under low discharge conditions (7Q10 –$10^{th}$) and 0.09 pounds cadmium per day, 0.13 pounds lead per day, and 24.3 pounds zinc per day to the East Fork Eagle Creek under high discharge conditions ($50^{th}$ –$90^{th}$). The total load from point discharges is estimated as 0.005 pounds cadmium per day, 0.009 pounds lead per day, and 0.82 pounds zinc per day to Prichard Creek, and 0.008 pounds cadmium per day, 0.001 pounds lead per day, and 1.95 pounds zinc per day to Beaver Creek. Based on Tables 8 and 9, the percentages of the loads accounted for by the discrete discharges can be calculated for Beaver and East Fork Eagle Creeks. Sufficient data is not currently available for Prichard Creek. The percent of metals load attributable to the discrete discharges at the four discharge tiers is provided in Table 10.

Table 9: Discrete Discharges of Dissolved Cadmium (Cd), Lead (Pb) and Zinc (Zn)

| Adit Name | Weighted[1] Discharge (cfs) | Dis. Cd (ug/L[2]) | Dis. Pb (ug/L) | Dis. Zn (ug/L) | Cd Load (lb/d[3]) | Pb Load (lb/d) | Zn Load (lb/d) |
|---|---|---|---|---|---|---|---|
| Mother Lode | 0.0016 | 4 | 6 | 470 | 0.000036 | 0.000053 | 0.004175 |
| Black Horse | 0.0091 | 7 | 89 | 570 | 0.000342 | 0.004348 | 0.027845 |
| Monarch (lower workings) | 0.0148 | 4 | 2 | 79 | 0.000320 | 0.000160 | 0.006315 |
| Orofino | 0.0132 | 14 | 4 | 2000 | 0.000995 | 0.000284 | 0.142111 |
| Red Monarch | 0.0371 | 10 | 2 | 2600 | 0.001998 | 0.000400 | 0.519593 |
| Silver Strike | 0.0091 | 4 | 41 | 470 | 0.000195 | 0.002003 | 0.022960 |
| Terrible Edith | 0.0231 | 11 | 16 | 780 | 0.001368 | 0.001990 | 0.096991 |
| Carlisle | 0.0552 | 26 | 2 | 6600 | 0.007736 | 0.000595 | 1.963795 |
| Jack Waite 7Q10-10th | 0.032^ | 8 | 17 | 2520 | 0.00138 | 0.003 | 0.435 |
| Jack Waite 50th-90th | 1.8[4] | 9 | 10 | 2510 | 0.09 | 0.10 | 24.3 |

[1] Weighted discharge based on the discharge of the Gem Adit (Appendix A)
[2] micrograms per liter
[3] pounds per day
[4] based on (McCulley, Frick and Gilman, 2001)

Table 10: Contribution of Point Discharges to Metals Loads of Beaver and East Fork Eagle Creeks at Flow Intervals

a) Beaver Creek

| Discharge | 7Q10-10th | 10th - 50th | 50th - 90th | 90th+ |
|---|---|---|---|---|
| Cadmium | 38.7% | 11% | 3.2% | 0.7% |
| Lead | 4.0% | 0.7% | 0.3% | 0.02% |
| Zinc | 63.3% | 12.9% | 3.9% | 1.2% |

b) East Fork Eagle Creek

| Discharge | 7Q10-10th | 10th - 50th | 50th - 90th | 90th+ |
|---|---|---|---|---|
| Cadmium | 13.8% | 4.6% | 28.2% | 5.1% |
| Lead | 7.5% | 1.5% | 9.0% | 1.8% |
| Zinc | 18.1% | 5.9% | 89% | 23% |

### 2.3.2.2.1.7 Non-discrete Discharges of Metals

The non-discrete discharge sources to the East Fork Eagle Creek are the Jack Waite mine waste piles, contaminated material eroded into Tributary Creek and contaminated material deposited further downstream along the East Fork. It is estimated the Jack Waite-Tributary Creek complex contributes 80% of the non-discrete load while the East Fork deposits contribute 20%. The non-discrete discharge sources to Beaver Creek are the Ray Jefferson Mill site waste piles, contaminated material deposited into the stream between the mill and the Carbon Center Bridge, and some tailings deposits identified upstream of Carbon Creek. The Ray Jefferson Mill site and waste piles are estimated to be 60% of the non-discrete load, while the stream deposits and upstream materials are 40%. The non-discrete sources to Prichard Creek above Murray are the Paragon and Monarch Mill sites and associated waste dumps, the Terrible Edith and Chester sites in Wesp Gulch, and fluvially deposited contaminated materials between the Paragon site and the Murray Bridge. The Paragon site is estimated to contribute 30% of the non-discrete load. The Monarch site is estimated to contribute and additional 30%. The Wesp Gulch sites are estimated to contribute 10%, while the stream deposits contribute the additional 30%.

#### 2.3.2.3. Sedimentation Data

Inspections of the North Fork and the Coeur d'Alene River provide abundant evidence suggesting bed load sediment has increased in the North Fork. Numerous large alluvial bars are present in the North Fork. Newly deposited bars are present along the floodplain of the North Fork, as are new channels cut after floods to bypass sediment deposits in channels. The Little North Fork is intermittent at locations due to cobble deposits. The gravel and cobble in transport is deposited eventually at the grade break in the river system that is located in the Coeur d'Alene River between Kingston and Cataldo. In this reach of the Coeur d'Alene River, the channel is braided through the deposited alluvium. Historical descriptions of the Coeur d'Alene River and its North Fork do not include the current sediment bars and braided channels (Russell, 1985).

##### 2.3.2.3.1 Riffle Armor Stability Indices

A more quantitative index of streambed instability is the riffle armor stability index (RASI) (Kappesser, 1993). The measurement consists of a 200-particle count and size measurement on a transect across a stream riffle using the methods of Wolman (1954). With this information, a particle size distribution curve is developed for the riffle. A RASI involves an additional measurement of the 30 largest particles found deposited on the point deposition bar located immediately downstream of the riffle. The RASI value is the percentage of particles in the distribution curve smaller than the mean size of the largest particles deposited on the point bar. Since the largest particles on the point bar represent the largest stream bed particles moved by the stream during the most recent channel altering event, the RASI provides an assessment of the percentage of the stream bed materials mobilized during the event. A RASI value provides an assessment of relative streambed stability. Values in the range of 28-60, with a mean of 44, have been calculated in non-managed streams of the upper St Joe River basin, which are believed to have high relative stability. These watersheds have very few or no roads and the last general disturbance of the area was the 1910 wildfire. Streams of managed watersheds with appreciable road infrastructures provide RASI values in the range of 66-99, with a mean of 82. These streams are believed to have streambed instability (Cross and Everest, 1995).

The RASI values for the stream segments listed as water quality limited, as well as an additional segments believed not to have impaired uses, are provided in Tables 11 and 12. With the exception of one stream (Tepee Creek), the RASI value range and means are indicative of streambed instability.

Table 11: Riffle Armor Stability Indices (RASI) for the Listed Water Quality Limited Segments of the North Fork Coeur d'Alene River

| Stream | HUC[1] Number | RASI Range | RASI Mean |
|---|---|---|---|
| North Fork Coeur d'Alene River | 17010301 3482 | 74-94 | 86 |
| Tepee Creek | 17010301 3508 | 53-61 | 56 |
| Big Elk Creek | 17010301 3511 | 86-89 | 87 |
| Calamity Creek | 17010301 5034 | 67-85 | 76 |
| Yellowdog Creek | 17010301 3506 | 68-72 | 72 |
| Prichard Creek | 17010301 3500 | 85-96 | 92 |
| East Fork Eagle Creek | 17010301 5617 | 80-85 | 85 |
| North Fork Coeur d'Alene River | 17010301 3481 | 90-94 | 93 |
| Little North Fork Coeur d'Alene River | 17010301 3485 | 92-96 | 94 |
| Copper Creek | 17010301 3487 | 93-97 | 95 |
| Burnt Cabin Creek | 17010301 5032 | 97-98 | 97 |

Note: RASI data developed by U.S. Forest Service (Lider, unpublished data).
[1] hydrologic unit code

Table 12:Riffle Armor Stability Indices (RASI) for Low Development Segments of the North Fork Coeur d'Alene River Subbasin

| Stream | HUC[1] Number | RASI Range | RASI Mean |
|---|---|---|---|
| North Fork Coeur d'Alene River | 17010301 | 85-94 | 89 |

Excessive streambed instability during the winter and spring months, when the eggs of fall spawning salmonids are incubating and the alevin life stage is using inter-gravel habitats, has been interpreted by Cross and Everest (1995) to seriously disrupt the reproduction of these species. Recent investigation indicates the scour depth of stream channels is a few inches deep (DeVries, 2000). Shallow scour depths spare redds placed deeper in the streambed, but would not protect alevins and young of the year that use the interstitial spaces of cobble near the bed surface. Instability also causes the filling of pools with cobble materials normally found on riffle gravel bars in a stream with a stable streambed. An additional and important result of bed instability is the loss of pool volume.

### 2.3.2.3.2 Residual Pool Volume

The amount of pool volume in streams can be estimated using residual pool volume measurements. Residual pool volume is the volume a stream pool would occupy if the stream reached a zero discharge condition. Under this condition, water would not flow over stream riffles, stream runs would hold little water, and the pools would make up the majority of the wetted volume of the stream. Residual pool volume is calculated using a box model from measurements of average pool depth, average pool width, pool length, and pool tail out depth. Pool tail out depth is subtracted from average pool depth to develop the third side of the box model. Residual pool volume is normally developed for a reach length of stream determined by a multiple of 20 times the bank full width. The values are normalized on the basis of pool volume per mile of stream. Residual pool volume increases with stream width. For this reason, residual pool volume values must be stratified by stream width to assess the relative amount of pool volume.

Residual pool volume data for the water quality limited segments have been stratified by bank full stream width (Table 13). Pool volume data of reference streams, which have low road densities, are provided for each stratification class allowing the interpretation of the values of the water quality limited segments. The North Fork segment between Yellowdog Creek and the South Fork confluence has diminished pool volume when compared to the upstream segment of the North Fork, which has few impacts, and the segment Tepee and Yellowdog Creeks, which have less width. Steamboat Creek has significant reduction in mean residual pool volume. All the other tributary segments listed as water quality limited have diminished residual pool volumes with the possible exception of the Little North Fork Coeur d'Alene River and Big Elk Creek. Some tributaries (Prichard, Shoshone, East Fork Eagle, and Yellowdog Creeks) have values indicative of the loss of most of the pool volume. The values shown in Table 13 indicate filling of pool volume is one result of stream channel instability.

### 2.3.2.4. Fish Population Data

Interference with natural recruitment and filling of pools caused by streambed instability should be reflected in the trout populations of the North Fork and its tributaries. Fall spawning fish that could have recruitment directly affected by streambed instability are no longer common in the North Fork or its tributaries. Mountain whitefish and bull trout are the native fall spawning fish. Whitefish populations are low, and bull trout are rare in the North Fork system (Idaho Department of Fish and Game [IDFG], 2001). The fall spawning Chinook salmon does spawn successfully in the lower reaches of the North Fork. Hunt and Bjornn (1993) assessed fish population density in the North Fork and its larger tributaries. More recently, Dunnigan and Bennett (1996) and DEQ BURP teams have estimated populations in some of the smaller tributaries.

Cutthroat trout and whitefish are salmonids found almost exclusively in the North Fork and its tributaries above the Yellowdog Creek confluence. Cutthroat trout spawning occurs almost exclusively in the tributaries to the North Fork Coeur d'Alene River (IDFG, 2001). Cutthroat trout and whitefish predominate in the river system below this point, but brook and rainbow trout were occasionally found in some tributaries.

Salmonid (trout) population densities (salmonid/square meter [$m^2$]/hour effort) of the listed and reference streams of similar size, but with little or no development (bold type), are summarized in Table 14. Reference streams (highlighted) are located in the Upper North Fork sub-watershed that has very little development. Reference streams range from 01 - 0.3 salmonid/$m^2$/hour effort with the exception of Independence Creek. The Independence Creek value developed from DEQ data may be low because it was collected in a reach of the stream quite near a popular camping area. The value developed from Hunt and Bjornn's data (1996) was developed in this lower reach of the stream as well. Where data are available, trout density values in most water quality limited segments are one or two orders of magnitude lower than the reference streams.

Table 13: Mean Residual Pool Volume and Stream Width for the Water Quality Limited Segments of the North Fork Coeur d'Alene River Subbasin (Streams are stratified by bank full width; reference streams (bold type and asterisk) with little development are listed to indicate expected mean residual pool volume)

| Stream | HUC Number | Bank Full Width ($ft^2$) | Residual Pool Volume ($ft^3/mi^3$) |
|---|---|---|---|
| **North Fork Coeur d'Alene River*** | 17010301 2700 | 23.9 | 41,099 |
| North Fork Coeur d'Alene River | 17010301 3481 | 77.6 | 118,907 |
| North Fork Coeur d'Alene River | 17010301 3482 | 48.2 | 314,757 |
| Steamboat Creek | 17010301 3495 | 25.8 | 14,916 |
| **Independence Creek*** | 17010301 3200 | 20.4 | 79,701 |
| Prichard Creek | 17010301 3500 | 20.5 | 2,304 |
| Burnt Cabin Creek | 17010301 5032 | 18.0 | 28,228 |
| Shoshone Creek | 17010301 3504 | 17.3 | 9,128 |
| East Fork Eagle Creek | 17010301 5617 | 17.2 | 9,235 |
| Lost Creek | 17010301 5643 | 16.3 | 20,047 |
| Falls Creek | 17010301 7504 | 15.6 | 32,727 |
| Little North Fork Coeur d'Alene River | 17010301 3485 | 15.4 | 119,540 |
| Beaver Creek | 17010301 3499 | 14.8 | 15,528 |
| **Buckskin Creek*** | 17010301 0000 | 12.6 | 24,345[2] |
| Copper Creek | 17010301 3487 | 13.1 | 12,253 |
| Yellowdog Creek | 17010301 3506 | 10.5 | 3,597 |
| Big Elk Creek | 17010301 3511 | 9.4 | 43,962 |
| **Spruce Creek*** | 17010301 0000 | 8.0 | 19,091[6] |
| Tepee Creek | 17010301 3508 | 8.0 | 6,534[6] |
| Calamity Creek | 17010301 5034 | 8.0[5] | 1,314[6] |
| Cub Creek | 17010301 5054 | 4.9 | 9,622 |

Note: Data developed from DEQ (Hartz, 1993b) and U.S. Forest Service (Lider, unpublished data).

1. hydrologic unit code
2. feet
3. cubic feet per mile
4. reference stream
5. estimated from wetted widths
6. value high possibly because of small data

Table 14: Fish Population per Unit Stream Length of the Water Quality Limited Segments of the North Fork Coeur d'Alene River Subbasin

| Stream | HUC[4] Number | Salmonid Density (fish/$m^2$/hr[5] effort) | Presence of Three Salmonid Age Classes | Sculpin Density (fish/$m^2$/hr effort) | Presence of Sculpin and Tailed Frogs |
|---|---|---|---|---|---|
| **North Fork Coeur d'Alene River**[*] | 17010301 2700 | 0.3314[1] | N.D. | 0.4285 | Yes |
| North Fork Coeur d'Alene River | 17010301 3481 | 0.0034[3] | N.D. | N.D. | N.D. |
| North Fork Coeur d'Alene River | 17010301 3482 | 0.0015[2] | No | 0.0028 | No |
| Steamboat Creek | 17010301 3495 | 0.0630[1,2] | Yes | 0.1654 | Yes |
| **Independence Creek**[*] | 17010301 3200 | 0.0021[2] 0.0048[3] | Yes | 0.1083[2] | Yes |
| Prichard Creek | 17010301 3500 | 0.0363[2] | Yes | 0.1039 | No |
| Burnt Cabin Creek | 17010301 5032 | 0.0079[1,2] | No | 0.3664 | Yes |
| Shoshone Creek | 17010301 3504 | 0.0241[2] | Yes | 0.3364 | No |
| EF Eagle Creek | 17010301 5617 | 0.0830[2] | Yes | 0.0000 | No |
| Falls Creek | 17010301 7504 | 0.0344[1,2] | Yes | 0.2421 | Yes |
| Little North Fork Coeur d'Alene River | 17010301 3485 | 0.0528[1,2] | Yes | 0.1178 | Yes |
| Beaver Creek | 17010301 3499 | 0.2847[2] | Yes | 0.3041 | No |
| **Buckskin Creek**[*] | 17010301 0000 | 0.1476[1,2] | Yes | 0.3576 | Yes |
| Copper Creek | 17010301 3487 | 0.0513[1,2] | Yes | 0.1289 | Yes |
| Yellowdog Creek | 17010301 3506 | 0.0309[1,2] | No | 0.1248 | Yes |
| **Spruce Creek** | 17010301 0000 | 0.2598[1,2] | Yes | 0.8295 | Yes |
| Tepee Creek | 17010301 3508 | 0.2360[2] | Yes | 0.4844 | Yes |
| Calamity Creek | 17010301 5034 | 0.0860[2] | No | 0.4997 | Yes |

Note: Bold streams are reference streams; Sculpin and tailed frogs are the other major cold water vertebrate species found by biological surveys on the North Fork. 1 - data from U.S. Forest Service; 2 - data from DEQ Beneficial Use Reconnaissance Program; 3- data from Hunt and Bjornn, 1993; 4- hydrologic unit code; 5- fish per square meter per hour effort electrofishing.

Two streams differ from typical trout density values where water quality limited segments are one or two orders of magnitude lower than reference streams. Beaver and upper Tepee Creeks have values in the range of the reference streams. At least three age classes of salmonids were found in most streams where age class data was available. Fewer age classes were the North Fork between Tepee and Yellowdog Creeks, Burnt Cabin, Yellowdog, and Calamity Creeks. Sculpin population densities were typically found in a range of 0.1 - 0.5 fish/$m^2$/hour effort. Only two streams where data was available were below this level: the North Fork between Tepee and Yellowdog Creeks and East Fork Eagle Creek. The absence of sculpin in the East Fork of Eagle Creek is likely the result of the presence of heavy metals. A similar absence of sculpin has been noted by DEQ, USGS, and others in metals impaired streams of the Silver Valley (Maret, 2001). Spruce Creek was above the normal range at 0.89 fish/$m^2$/hour effort. One explanation for the observed general reduction of trout density, while sculpin density is high, is that trout are harvested by anglers, while sculpin are not. Another explanation is the reduction of pool volume, on which trout are dependent, in the watershed. Tailed frogs were found in many cases where data on other species was available. Tailed frogs were not detected on five stream segments.

Trout densities can be affected by increased pressure by anglers, since cutthroat trout are easily over-harvested. Studies in the 1970s indicated that trout populations in the North Fork and St Joe Rivers were declining. As a result, IDFG instituted stringent harvest regulations designed to recover trout populations. St. Joe River trout populations have increased in response to these regulations, while the North Fork populations have not. However, a recent assessment indicated that compliance with the harvest regulations is superior on the North Fork when compared to the St. Joe River (Chip Corsi, Personal Communication). Fish populations in the St. Joe River Subbasin have been assessed and found to generally be much higher than those of the North Fork Coeur d'Alene River Subbasin (DEQ, 2000b). The evidence indicates that streambed instability may have lead to interference with trout recruitment and the loss of pools, a critical habitat to trout. As a result, trout densities in the North Fork are low. Fishing regulations were made more restrictive in the North Fork in 2000. The six fish limit in the North Fork below Yellowdog Creek and in the Little North Fork below Laverne Creek was reduced to two fish with no fish between 8 and 16 inches.

#### 2.3.2.5. Sediment Loading Data

Sediment monitoring in-stream is a very time consuming and costly undertaking. Sediment monitoring should be conducted for seven years at a site to develop a database that accounts for the variance of discharge affects on sediment yield and transport from year to year. The investment required to conduct sediment monitoring is high; therefore, the time and costs involved do not make sediment monitoring a viable approach to determining if sediment is a pollutant of concern. A sediment modeling approach uses coefficients developed over long periods in paired watersheds. This approach is the most time and cost efficient approach to estimating sediment for the purposes of total maximum daily loads (TMDLs).

##### 2.3.2.5.1. Land Use Data

Sediment loading occurs from the entire watershed. It is not necessarily restricted to the water quality limited segments of the North Fork Coeur d'Alene River Subbasin. In the following table set (Tables 15a-15g), sediment load is analyzed based on major contributing watersheds to the seven sub-watersheds (Upper North Fork, Tepee Creek, Middle North Fork, Shoshone-Lost Creeks, Prichard-Beaver Creeks, Lower North Fork, and Little North Fork) of the larger Subbasin. Sediment yield is estimated from land use data developed from USFS and Idaho Department of Lands (IDL) geographical information systems (GIS) timber stand coverage and delineation of pasture lands along the river bottom. Fire and road GIS coverages developed by the USFS and BLM were used to develop data on areas that received two wildfires and the forest road mileage and densities. A USFS GIS coverage of unstable land types was used to develop the road mileage on unstable land types. Highway land use acreage was estimated based on the road length (GIS road coverage) and the known right of way width. These values are reported in Tables 15 a-15g.

Table 15: Land Use of Major Watersheds Draining to North Fork Coeur d'Alene River

a) Upper North Fork Coeur d'Alene River

| Watershed | Upper NF Cd'A River | Mosquito Creek | Buckskin Creek | Spruce Creek | Devil Creek | Mid-Upper North Fork | Deer Creek | Alden Creek | Jordan Creek | Independence Creek | Lower Upper North Fork |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Conifer forest (acres) | 8,984 | 3,509 | 4,361 | 6,628 | 3,242 | 5,947 | 6,107 | 4,745 | 9,756 | 36,760 | 7,966 |
| Non-stocked forest (acres) | 127 | 0 | 315 | 163 | 25 | 386 | 307 | 323 | 1,547 | 1,320 | 1,350 |
| Double wildfire burn (acres) | 0 | 1 | 538 | 7 | 1,494 | ? | 1,074 | 4,858 | 2,844 | 14,467 | 10,956 |
| Highway (acres) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5.7 |
| Forest road (miles) | 41.2 | 18.3 | 23.3 | 32.1 | 10.5 | 13.1 | 4.9 | 6.0 | 29.8 | 110.9 | 21.2 |
| Average road density (miles/mile$^2$) | 2.9 | 3.3 | 3.2 | 3.0 | 2.1 | 1.3 | 0.5 | 0.8 | 1.7 | 1.9 | 1.4 |
| Road crossing number | 5 | 5 | 8 | 7 | 1 | 4 | 0 | 1 | 11 | 25 | 4 |
| Road crossing frequency | 0.3 | 0.6 | 0.8 | 0.6 | 0.2 | 0.4 | - | 0.1 | 0.5 | 0.3 | 0.2 |
| Unstable roads (miles) | 27.4 | 11.4 | 13.7 | 21.2 | 8.5 | 7.4 | 0 | 4.7 | 22.8 | 72.5 | 10.5 |
| Encroaching road (miles) | 1.5 | 1.0 | 1.4 | 2.4 | 0.1 | 1.5 | 0 | 0.4 | 1.9 | 3.9 | 1.8 |
| Projected CWE[1] Score | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 |

Data taken from CDASTDS, IDPNFIRE and CDAROADS databases cut for specific sub-watersheds. 1. Cumulative effects watershed score calculated from average of known watershed.

b) Tepee Creek above Independence Creek

| Watershed | Big Elk Creek | Upper Tepee Creek | Trail Creek | Lower Tepee Creek |
|---|---|---|---|---|
| Conifer forest (acres) | 7,468 | 14,863 | 15,801 | 13,209 |
| Non-stocked forest (aresc) | 35 | 516 | 347 | 1,013 |
| Double wildfire burn (acres) | 0 | 250 | 1,791 | 4,942 |
| Forest road (miles) | 93.1 | 90.7 | 158.8 | 16.7 |
| Average road density (miles/mile$^2$) | 7.9 | 3.8 | 6.3 | 0.8 |
| Road crossing number | 22 | 13 | 38 | 16 |
| Road crossing frequency | 1.3 | 0.4 | 1.1 | 0.4 |
| Unstable roads (miles) | 75.1 | 49.3 | 126.1 | 16.1 |
| Encroaching road (miles) | 4.8 | 3.8 | 11.2 | 3.0 |
| Calculated CWE[1] Score | 16.5 | 16.5 | 16.5 | 16.5 |

Data taken from CDASTDS, IDPNFIRE and CDAROADS databases cut for specific sub-watersheds.
1. Cumulative effects watershed score calculated from average of known watersheds.

c) Middle North Fork Coeur d'Alene River

| Watershed | Cinnamon Creek | Brett Creek | Miners Creek | Flat Creek | Big Hank Creek and East Side Streams | Yellowdog Creek |
|---|---|---|---|---|---|---|
| Conifer forest (acres) | 3,552 | 4,945 | 3,967 | 11,238 | 9,325 | 5,090 |
| Non-stocked forest (acres) | 842 | 568 | 24 | 13 | 1,018 | 5 |
| Double wildfire burn (acres) | 1,007 | 3,570 | 0 | 0 | 990 | 0 |
| Highway (acres) | 3.1 | 15.4 | 10.6 | 19.4 | 9.9 | 0 |
| Forest road (miles) | 13.7 | 25.6 | 50.4 | 161.8 | 77.0 | 74.5 |
| Average road density (miles/mile$^2$) | 2.0 | 3.0 | 8.1 | 9.2 | 4.8 | 9.4 |
| Road crossing number | 3 | 17 | 8 | 34 | 29 | 19 |
| Road crossing frequency | 0.3 | 1.2 | 1.2 | 1.6 | 1.1 | 1.6 |
| Unstable roads (miles) | 1.5 | 23.7 | 31.6 | 103.6 | 37.0 | 38.9 |
| Encroaching road (miles) | 0.3 | 3.8 | 1.6 | 8.5 | 5.3 | 4.6 |
| Calculated CWE[1] Score | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 |

Data taken from CDASTDS, IDPNFIRE and CDAROADS databases cut for specific sub-watersheds.
1 Cumulative effects watershed score calculated from average of known watersheds.

d) Shoshone and Lost Creeks

| Watershed | Upper Shoshone Creek | Falls Creek | Lower Shoshone Creek | Lost Creek |
|---|---|---|---|---|
| Conifer forest (acres) | 25,288 | 8,607 | 9,967 | 13,093 |
| Non-stocked forest (acres) | 637 | 70 | 152 | 1,384 |
| Double wildfire burn (acres) | 66 | 0 | 0 | 0 |
| Forest road (miles) | 232.6 | 149.7 | 131.3 | 65.6 |
| Average road density (miles/mile$^2$) | 5.7 | 5.1 | 4.5 | 2.9 |
| Road crossing number | 54 | 21 | 18 | 21 |
| Road crossing frequency | 1.0 | 2.6 | 1.2 | 1.0 |
| Unstable roads (miles) | 128.8 | 78.7 | 52.9 | 39.3 |
| Encroaching road (miles) | 13.3 | 2.9 | 4.9 | 3.4 |
| Calculated CWE[1] Score | 16.5 | 16.5 | 16.5 | 16.5 |

Data taken from CDASTDS, IDPNFIRE and CDAROADS databases cut for specific sub-watersheds.
1 Cumulative effects watershed score calculated from average of known watersheds.

e) Prichard and Beaver Creeks

| Watershed | WF Eagle Creek | EF Eagle Creek | Eagle Creek | Upper Prichard Creek [2] | Lower Prichard Creek [2] | Upper Beaver Creek [2] | Lower Beaver Creek |
|---|---|---|---|---|---|---|---|
| Conifer forest (acres) | 12,258 | 14,187 | 1,340 | 20,858 | 9,637 | 12,792 | 13,673 |
| Non-stocked forest (acres) | 233 | 600 | 13 | 3,759 | 19 | 869 | 491 |
| Double wildfire burn (acres) | 0 | 0 | 0 | 862 | 0 | 0 | 0 |
| Highway (acres) | 0 | 0 | 4.8 | 40.5 | 34.7 | 21.8 | 22.9 |
| Forest road (miles) | 87.5 | 123.8 | 17.5 | 81.5 | 111.7 | 118.1 | 103.5 |
| Average road density (miles/mile$^2$) | 4.5 | 5.4 | 8.3 | 2.1 | 7.4 | 5.5 | 4.7 |
| Road crossing number | 25 | 35 | 1 | 45 | 25 | 63 | 36 |
| Road crossing frequency | 1.7 | 2.2 | 1.0 | 1.4 | 1.6 | 2.7 | 1.4 |
| Unstable roads (miles) | 55.2 | 82.6 | 7.1 | 47.1 | 52.2 | 79.5 | 66.6 |
| Encroaching road (miles) | 6.2 | 10.3 | 0.2 | 12.0 | 3.7 | 13.3 | 6.3 |
| Calculated CWE[1] Score | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 |

Data taken from CDASTDS, IDPNFIRE and CDAROADS databases cut for specific sub-watersheds.
1. Cumulative effects watershed score calculated from average of known watersheds.
2. BLM land assumed to have the same non-stocked rate as USFS lands (UP - 13.6% of 3,069 acres = 417 acres; LP - 0.13% of 4,415 acres = 6 acres; UB - 5.4% of 2,863 acres = 154 acres)

f) Lower North Fork Coeur d'Alene River

| Watershed | Downey Creek | Uranus and Creaky Creek Group | Grizzly Creek | Browns Gulch | Steamboat Creek | Graham Creek | Cougar Gulch | Lower NF Cd'A River |
|---|---|---|---|---|---|---|---|---|
| Pasture (acres) | - | 1,096 | - | 1.023 | - | - | - | 1,472 |
| Conifer forest (acres) | 5,960 | 16,998 | 10,120 | 11,405 | 25,922 | 5,779 | 12,222 | 19,206 |
| Non-stocked forest (acres) | 75 | 276 | 306 | 304 | 582 | 184 | 99 | 237 |
| Double wildfire burn (acres) | 0 | 6 | 87 | 111 | 0 | 0 | 0 | 0 |
| Highway (acres) | 0.2 | 61.0 | 13.2 | 19.9 | 0 | 0.9 | 0 | 50.0 |
| Forest road (miles) | 79.6 | 186.7 | 68.2 | 125.5 | 423.0 | 0.2 | 170.1 | 219.5 |
| Average road density (miles/mile$^2$) | 8.4 | 6.5 | 4.2 | 6.3 | 10.2 | 0.0 | 8.8 | 3.0 |
| Road crossing number | 47 | 43 | 21 | 38 | 111 | 1 | 33 | 86 |
| Road crossing frequency | 3.8 | 1.4 | 0.8 | 1.4 | 2.1 | 0.1 | 1.3 | 1.5 |
| Unstable roads (miles) | 52.8 | 118.6 | 50.1 | 67.5 | 213.6 | 0.0 | 88.1 | 100.2 |
| Encroaching road (miles) | 6.4 | 9.0 | 5.8 | 7.1 | 25.3 | 0.0 | 6.0 | 17.7 |
| Calculated CWE[1] Score | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 |

Data taken from CDASTDS, IDPNFIRE and CDAROADS databases cut for specific sub-watersheds.
1. Cumulative effects watershed score calculated from average of known watersheds.

g) Little North Fork Coeur d'Alene River

| Watershed | Upper Little NF Cd'A River | Hudlow Creek | Iron Creek | Barney Creek | Burnt Cabin Creek & adj. | Deception Creek | Skookum Creek | Lieberg Creek | Laverne Creek | Copper Creek | Bumblebee Creek | Lower Little NF Cd'A River |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pasture (acres) | - | - | - | - | - | - | - | - | - | - | - | 344.2 |
| Conifer forest (acres) | 10,680 | 6,636 | 6,055 | 2,652 | 18,404 | 3,505 | 4,371 | 15,501 | 11,314 | 12,152 | 15,448 | - |
| Non-stocked forest (acres) | 21 | 112 | 14 | 33 | 37 | 0 | 156 | 172 | 59 | 26 | 490 | - |
| Double wildfire burn (acres) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| Forest road (miles) | 142.4 | 77.0 | 116.0 | 30.6 | 308.8 | 68.4 | 61.0 | 210.1 | 127.6 | 145.0 | 170.4 | - |
| Average road density (miles/mile$^2$) | 8.5 | 7.3 | 12.2 | 7.3 | 10.7 | 12.5 | 8.6 | 8.6 | 7.2 | 7.6 | 6.8 | - |
| Road crossing number | 38 | 26 | 28 | 4 | 69 | 39 | 9 | 31 | 19 | 31 | 42 | |
| Road crossing frequency | 1.6 | 1.9 | 2.1 | 0.6 | 2.0 | 4.6 | 1.1 | 1.2 | 0.8 | 1.2 | 1.3 | - |
| Unstable roads (miles) | 79.8 | 51.3 | 89.2 | 15.2 | 119.7 | 45.7 | 24.1 | 155.9 | 47.1 | 72.4 | 126.4 | |
| Encroaching road (miles) | 7.9 | 6.4 | 7.0 | 0.9 | 17.1 | 7.4 | 1.9 | 8.7 | 4.4 | 6.2 | 9.9 | |
| Calculated CWE[1] Score | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | 16.5 | |

Data taken from CDASTDS, IDPNFIRE and CDAROADS databases cut for specific sub-watersheds. 1. Cumulative effects watershed score calculated from average of known watershed

### 2.3.2.5.1. Sediment Yield and Export.

Sediment yields were developed separately for agricultural lands (pasture), forestlands, forest roads, and stream banks. Sediment export from eroding land to the stream system was assumed to be 100%. Additional assumptions and documentation of the sediment model are provided in Appendix C.

#### 2.3.2.5.1.1. Land Use

##### 2.3.2.5.1.1.1. Agricultural Land Sediment Yield

Sediment yield was estimated from agricultural lands (pasture) using the Revised Universal Soil Loss Equation (RUSLE) (equation 1) (Hogan, 1999).

Equation 1: A = (R)(K)(LS)(C)(D) tons per acre per year where:

- A is the average annual soil loss from sheet and rill erosion
- R is climate erosivity
- K is the soil erodibility
- LS is the slope length and steepness
- C is the cover management
- D is the support practices

RUSLE does not take into account bank erosion, gully erosion, or scour. RUSLE applies to cropland, pasture, hay land, or other land that has some vegetation improvement by tilling or seeding. Based on the soils characteristics and the slope, sediment yield was developed for the agricultural lands of each watershed. Sediment yield from agricultural (grazing) lands was estimated by applying the RUSLE developed sediment yield coefficients of 0.03 and 0.06 tons/acre/year to the land area in agricultural use (see Tables 15a-15g). Although the agricultural land in the North Fork is in the floodplain and relatively flat, drainage ways to the river exist. The RUSLE model assumes sediment delivery is to adjacent water bodies.

##### 2.3.2.5.1.1.2. Forestland Sediment Yield

Forestland sediment yield was based on sediment production coefficients. These are the mean coefficients developed from in-stream sediment measurements on Belt geologies of northern and north central Idaho (Patten, Personal Communication.). The sediment yield is 15 tons per square mile per year with a range from 12-17 for the Belt Super group geology. The mean values were used for conifer and sparse conifer forests, including clear-cut areas that are fully stocked under state forest practices rules. Model runs were completed that provided the clear-cut areas (seedling-sapling) with the highest sediment yield coefficient. These model runs did not yield significantly higher sediment yields. The professional judgement of the sediment advisory group was to differentiate the higher sediment yield for non-stocked land. The highest values in the range were used for lands that were not fully stocked with trees. Areas twice burned by wildfires were provided a small sediment yield value increase to adjust the sediment yield from these areas to the level of non-stocked lands. These values were divided by 640 acres per square mile (Table

16). Sediment yields from forestlands were estimated by applying the sediment yield coefficients to the land area in forest use (See Tables 15a-15g).

Table 16: Estimated Sediment Yield Coefficients for Forestland Uses Based on the Geologies of the Watersheds

| **Land use type sediment export coefficient** | **Belt Super group Precambrian meta sediments** |
|---|---|
| Conifer forest (ton/acre/year) | 0.023 |
| Non-stocked Forest (tons/acre/year) | 0.027 |
| Double Wildfire Burn (ton/acre/year) | 0.004 |
| Highway (tons/acre/year) | 0.019 |

### 2.3.2.5.1.1.3. Highway Sediment Yield

Land in developed highway (paved road) right of ways was assigned a sediment yield coefficient on the low end of the range expected from a Belt geologic type. Much of the prism of a paved road is covered by a non-erosive surface. Thus the yield from these areas is curtailed.

### 2.3.2.5.1.2. Forest Roads

### 2.3.2.5.1.2.1. Road Surface Sediment

Forest road fine sediment yield was estimated using a relationship between the cumulative watershed effects (CWE) score and the sediment yield per mile of road (Figure 5)(IDL, 2000). The relationship was developed for roads on a Kaniksu granitic geology in the LaClerc Creek watershed (McGreer,1998). Its application to roads on Belt geologies conservatively overestimates sediment yields from these systems. Since CWE scores are not available for forest roads of the North Fork Subbasin, a score of 16.5 was assigned. This value is based on the average CWE score of six reference watersheds in neighboring Subbasin 17010303 (Wolf Lodge, Cedar, Fourth of July, Thompson, Latour, and Baldy), where CWE scores were developed. These reference watersheds are located on Belt Super group geologic type. The watershed CWE score was used to develop a sediment yield in tons per mile, which was multiplied by the estimated road mileage within 200 feet of the road crossing (See Tables 15a-15g). In the case of roads, it was assumed that all sediment was delivered to the stream system. These are conservative over-estimates of actual delivery.

### 2.3.2.5.1.2.2. Road Failure Sediment

Forest roads can fail into streams. The delivery from road failures is typically estimated directly in the CWE assessments. Since CWE assessments have not been completed in the North Fork Subbasin, the road failure sediment delivery rate was estimated from existing data. The miles of road on unstable land types were estimated for the North Fork sub-watersheds and for five reference watersheds (Wolf Lodge, Cedar, Fourth of July, Willow, and Thompson) where CWE assessment was completed. The reference watersheds are on the same geologic type as the North Fork watersheds. The failure and delivery rates are known for the reference watersheds and were calculated by ratio of the roads on unstable land types for the North Fork watersheds. Road failure sediment yield was annualized based on high discharge events with an estimated ten year return time.

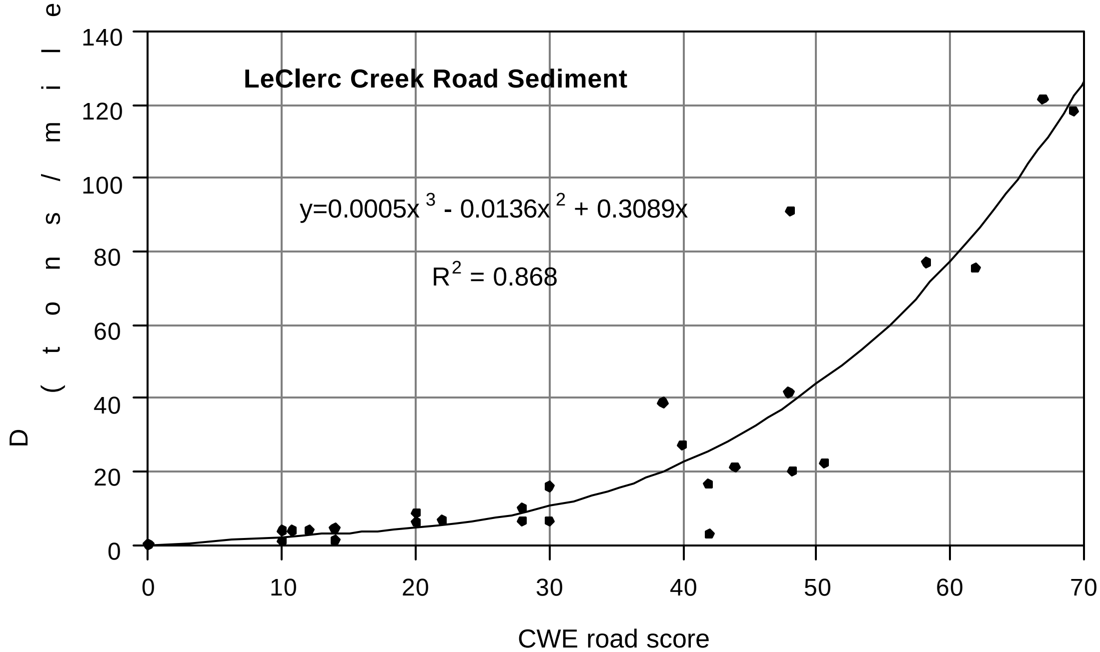



Figure 5: Sediment Export of Roads Based on Cumulative Watershed Effects Scores

## 2.3.2.5.1.2.3. Road Encroachment Sediment

Sediment yield resulting from road encroachment was modeled based on a set cross-section of 56 feet. This is the weighted mean channel width of the many channels for which data has been collected. The mean was weighted by stream length (Appendix C). The model assumes one-quarter inch erosion from the channel and the banks of stream reaches where roads encroach within 50 feet of the stream. The sediment contribution from this source was annualized based on large discharge events every 10 years.

## 2.3.2.5.1.3. Stream Bank Erosion

Stream bank erosion yields sediment to the stream along the North Fork between Prichard Creek and the confluence with the South Fork. The bank recession rate and height and length of eroding bank were measured using Natural Resource Conservation Service methods. The sedimentation rate from eroding banks was estimated based on these measurements (Sampson, Personal Communication).

## 2.3.2.5.2 Sedimentation Estimates

Sedimentation estimates were developed by adding the various sediment yields prorated for delivery to the channels (Tables 17a-17g).

Table 17: Estimated Sediment Export of Major Watersheds
a) Upper North Fork Coeur d'Alene River

| Watershed | Upper NF Cd'A River | Mosquito Creek | Buckskin Creek | Spruce Creek | Devil Creek | Mid Upper NF | Deer Creek | Alden Creek | Jordan Creek | Independence Creek | Lower Upper North Fork |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Conifer forest (tons/year) | 206.6 | 80.7 | 100.3 | 152.5 | 74.6 | 136.8 | 140.5 | 109.1 | 224.4 | 845.5 | 183.2 |
| Unstocked forest (tons/year) | 3.4 | 0.0 | 8.5 | 4.4 | 0.6 | 10.4 | 8.3 | 8.8 | 41.7 | 35.7 | 36.5 |
| Double wildfire yield (tons/year) | 0.0 | 0.0 | 2.2 | 0.0 | 6.0 | 4.8 | 4.3 | 19.4 | 11.4 | 57.9 | 37.2 |
| Road crossings (tons/year) | 1.9 | 1.9 | 3.0 | 2.7 | 0.4 | 1.5 | 0.0 | 0.4 | 4.2 | 9.5 | 1.5 |
| Road failures (tons/year) | 4.8 | 3.2 | 2.4 | 3.7 | 1.5 | 1.3 | 0.0 | 0.8 | 4.0 | 12.8 | 1.8 |
| Road encroachment (tons/year) | 74.9 | 50.0 | 70.0 | 119.9 | 4.9 | 74.9 | 0.0 | 20.0 | 94.9 | 289.7 | 89.9 |
| Total (tons/year) | 291.7 | 135.8 | 186.4 | 283.2 | 88.0 | 229.7 | 153.1 | 158.5 | 380.3 | 1,156.1 | 350.1 |

Note: Road sedimentation based on cumulative watershed effects score of 16.5 that translates to 5 tons/mile/year based on figure 5.

b) Tepee Creek above Independence Creek

| Watershed | Big Elk Creek | Upper Tepee Creek | Trail Creek | Lower Tepee Creek |
|---|---|---|---|---|
| Conifer forest (tons/year) | 171.8 | 341.8 | 363.5 | 303.8 |
| Unstocked forest (tons/year) | 1.0 | 14.0 | 9.3 | 27.3 |
| Double wildfire yield (tons/year) | 0.0 | 1.0 | 7.2 | 19.8 |
| Road crossings (tons/year) | 8.3 | 4.9 | 14.4 | 6.1 |
| Road failures (tons/year) | 13.3 | 8.7 | 22.3 | 2.8 |
| Road encroachment (tons/year) | 239.7 | 189.8 | 559.4 | 149.8 |
| Total (tons/year) | 434.1 | 560.2 | 976.1 | 509.6 |

Note: Road sedimentation based on cumulative watershed effects score of 16.5 that translates to 5 tons/mile/year based on figure 5.

c) Middle North Fork Coeur d'Alene River

| Watershed | Cinnamon Creek | Brett Creek | Miners Creek | Flat Creek | Big Hank Creek and East Side Streams | Yellowdog Creek |
|---|---|---|---|---|---|---|
| Conifer forest (tons/year) | 81.7 | 113.7 | 91.2 | 258.5 | 214.5 | 117.1 |
| Unstocked forest (tons/year) | 22.8 | 15.4 | 0.6 | 0.3 | 27.5 | 0.1 |
| Double wildfire yield (tons/year) | 4.0 | 14.3 | 0.0 | 0.0 | 4.0 | 0.0 |
| Road crossings (tons/year) | 0.0 | 0.3 | 0.2 | 0.3 | 0.2 | 0.0 |
| Road failures (tons/year) | 1.1 | 6.4 | 3.0 | 12.9 | 11.0 | 7.2 |
| Road encroachment (tons/year) | 0.3 | 4.2 | 5.6 | 18.3 | 6.5 | 6.9 |
| Total (tons/year) | 14.9 | 189.8 | 79.9 | 424.6 | 264.8 | 229.7 |
| | 124.8 | 344.1 | 180.5 | 711.9 | 528.5 | 361.0 |

Note: Road sedimentation based on cumulative watershed effects score of 16.5 that translates to 5 tons/mile/year based on figure 5.

d) Shoshone and Lost Creeks

| Watershed | Upper Shoshone Creek | Falls Creek | Lower Shoshone Creek | Lost Creek |
|---|---|---|---|---|
| Conifer forest (tons/year) | 581.7 | 198.0 | 229.2 | 301.1 |
| Unstocked forest (tons/year) | 17.2 | 1.9 | 4.1 | 34.6 |
| Double wildfire yield (tons/year) | 0.1 | 0.0 | 0.0 | 0.0 |
| Road crossings (tons/year) | 20.5 | 8.0 | 6.8 | 8.0 |
| Road failures (tons/year) | 22.8 | 13.9 | 9.4 | 6.9 |
| Road encroachment (tons/year) | 664.3 | 144.9 | 244.8 | 169.8 |
| Total (tons/year) | 1,306.6 | 366.7 | 494.3 | 520.5 |

Note: Road sedimentation based on cumulative watershed effects score of 16.5 that translates to 5 tons/mile/year based on figure 5.

e) Prichard and Beaver Creeks

| Watershed | West Fork Eagle Creek | East Fork Eagle Creek | Eagle Creek | Upper Prichard Creek | Lower Prichard Creek | Upper Beaver Creek | Lower Beaver Creek |
|---|---|---|---|---|---|---|---|
| Conifer forest (tons/year) | 282.0 | 326.3 | 30.8 | 479.7 | 221.7 | 294.2 | 314.2 |
| Unstocked forest (tons/year) | 6.3 | 16.2 | 0.3 | 101.5 | 0.5 | 23.5 | 13.3 |
| Double wildfire yield (tons/year) | 0.0 | 0.0 | 0.0 | 3.5 | 0.0 | 0.0 | 0.0 |
| Road crossings (tons/year) | 0.0 | 0.0 | 0.1 | 0.8 | 0.7 | 0.5 | 0.5 |
| Road failures (tons/year) | 9.5 | 13.3 | 0.4 | 17.0 | 9.5 | 23.9 | 13.6 |
| Road encroachment (tons/year) | 9.8 | 14.6 | 1.3 | 8.3 | 9.2 | 14.0 | 11.8 |
| Total (tons/year) | 309.7 | 514.5 | 10.0 | 599.3 | 184.8 | 664.3 | 314.7 |
| | 617.3 | 884.9 | 42.9 | 1,210.1 | 426.4 | 1,020.4 | 668.1 |

Note: Road sedimentation based on cumulative watershed effects score of 16.5 that translates to 5 tons/mile/year based on figure 5.

f) Lower North Fork Coeur d'Alene River

| Watershed | Downey Creek | Uranus and Creaky Creek Group | Grizzly Creek | Browns Gulch | Steamboat Creek | Graham Creek | Cougar Gulch | Lower North Fork Cd'A River |
|---|---|---|---|---|---|---|---|---|
| Pasture (tons/year) | 0.0 | 32.9 | 0.0 | 30.7 | 0.0 | 0.0 | 0.0 | 44.2 |
| Conifer forest (tons/year) | 137.0 | 391.0 | 232.8 | 262.3 | 596.2 | 133.0 | 281.1 | 441.7 |
| Unstocked forest (tons/year) | 2.0 | 7.5 | 8.3 | 8.2 | 15.7 | 5.0 | 1.7 | 6.4 |
| Double wildfire yield (tons/year) | 0.0 | 0.0 | 0.3 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| Highway (tons/year) | 0.0 | 1.2 | 0.2 | 0.4 | 0.0 | 0.0 | 0.0 | 1.0 |
| Road crossings (tons/year) | 17.8 | 16.3 | 8.0 | 14.4 | 42.0 | 0.4 | 12.5 | 32.6 |
| Road failures (tons/year) | 9.3 | 21.0 | 8.8 | 12.0 | 37.7 | 0.0 | 15.5 | 17.7 |
| Road encroachment (tons/year) | 320.7 | 449.4 | 289.7 | 354.7 | 1,263.7 | 0.0 | 299.7 | 884.0 |
| Bank erosion (tons/year) | - | - | - | - | - | - | - | 1,150 |
| Total (tons/year) | 486.8 | 919.3 | 548.1 | 683.2 | 1,955.3 | 138.4 | 610.5 | 2,577.6 |

Note: Road sedimentation based on cumulative watershed effects score of 16.5 that translates to 5 tons/mile/year based on figure 5. Dash (-) indicates no source in watershed.

g) Little North Fork Coeur d’Alene River

| Watershed | Upper Little North Fork Cd’A River | Hudlow Creek | Iron Creek | Barney Creek | Burnt Cabin Creek | Deception Creek | Skookum Creek | Lieberg Creek | Laverne Creek | Copper Creek | Bumblebee Creek | Lower Little NF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pasture (tons/year) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 10.3 |
| Conifer forest (tons/year) | 245.7 | 152.7 | 139.3 | 61.0 | 423.3 | 80.6 | 100.5 | 356.5 | 260.2 | 279.5 | 355.3 | 0.0 |
| Unstocked forest (tons/year) | 0.5 | 3.0 | 0.4 | 0.9 | 1.0 | 0.0 | 4.2 | 4.7 | 2.0 | 0.7 | 13.2 | 0.0 |
| Double wildfire yield (tons/year) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Road crossings (tons/year) | 14.4 | 9.8 | 10.6 | 1.5 | 26.1 | 14.8 | 3.4 | 11.7 | 7.2 | 11.7 | 15.9 | 0.0 |
| Road failures (tons/year) | 14.1 | 9.0 | 15.8 | 2.7 | 21.2 | 8.0 | 4.3 | 27.5 | 13.7 | 12.8 | 22.3 | 0.0 |
| Road encroachment (tons/year) | 394.6 | 319.7 | 349.4 | 45.0 | 854.1 | 369.6 | 78.8 | 434.5 | 219.8 | 309.7 | 494.5 | 0.0 |
| Total (tons/year) | 669.3 | 494.2 | 515.5 | 111.1 | 1,325.7 | 473.1 | 191.2 | 834.9 | 502.9 | 614.4 | 901.2 | 10.3 |

Note: Road sedimentation based on cumulative watershed effects score of 16.5 that translates to 5 tons/mile/year based on figure 5. Dash (-) indicates no source in water

The total estimated annual sediment delivery to the North Fork Coeur d'Alene River is 30,370 tons per year. The natural background sediment yield is based on the assumption that the watershed is forested in at least seedling and sapling trees. The mid-range value of the sediment yield coefficient was multiplied by the entire watershed acreage to develop a background sediment yield of 13,094 tons per year. An annual excess of 17,276 tons of sediment per year is estimated by this method to be delivered to the river. The sedimentation for the entire watershed is 132% above estimated natural sedimentation. The percentage above background sedimentation for each Subbasin ranges from 43 to 204% (Table 18). These annualized values are deceiving, because they have been annualized. Massive sediment delivery to the system occurs during high discharge events typically associated with rain on snow conditions. These events occur on the average every 10 to 15 years. Between 172,760 and 259,140 tons of excess sediment are delivered to the river during most of these single large events. The river exports the sediment during the periods between the large discharge events.

Table 18: Estimated Background and Sediment Delivery of Sub-Watersheds of the North Fork Coeur d'Alene River Subbasin

| Watershed | Upper North Fork Cd'A River | Tepee Creek | Middle North Fork Cd'A River | Shoshone-Lost Creeks | Prichard - Beaver Creeks | Lower North Fork Cd'A River | Little North Fork Cd'A River | Subbasin Total |
|---|---|---|---|---|---|---|---|---|
| Estimated sediment (tons/year) | 3,413.0 | 2,480.0 | 2,254.0 | 2,686.9 | 4,869.7 | 7,919.2 | 6,644.7 | 30,369.7 |
| Estimated background (tons/year) | 2,389.0 | 1,224.8 | 934.8 | 1,359.3 | 2089.7 | 2,608.5 | 2,488.2 | 13,094.3 |
| Percent above background | 42.8% | 102.4% | 141.1% | 97.7% | 133% | 203.5% | 167.0% | 131.9% |

Sedimentation rates in excess of 100% of natural sedimentation are likely sufficiently high to exceed water quality standards (Washington Forest Practices Board, 1995). However, the sediment yield from the Upper North Fork sub-watershed is 43% above natural background, and the beneficial uses are supported. The upper basin is of similar geology (Pre-cambrium Belt of the Wallace, Prichard, and Stripped Peak series), soils (predominantly podsolic), vegetation (mixed coniferous forest), weather patterns (weak maritime), and landform (glaciated mountains) to the other sub-watersheds. The upper watershed's sediment yield is an appropriate interim target for a sediment TMDL addressing the remaining sub-watersheds.

The estimated sediment yield per square mile based on the model is 33.9 tons. The USGS measured sediment at the Enaville gauge during water year 1999 for the Coeur d'Alene Basin Remedial Investigation and Feasibility Study (URS Greiner, 2000). The discharge of water year 1999 was numerically very close to average discharge from the North Fork. The USGS measurements provided a sediment yield of 28 tons per square mile. Although the results from the two methods are not identical, the results are in the same general range.

The model results only estimate the delivery of sediment to the river system. The transport of sediment in the North Fork watershed and export of sediment from the watershed is not addressed. The riffle armor stability and residual pool volume data indicate the current sediment load destabilizes the channels. Sediment loads associated with large fire events in the first three decades of the twentieth century are likely still present to some extent in the channels. The roads, which flank both shores of the lower North Fork, cut off sloughs from the river. Visual evidence from excavation of one such slough near the Bumblebee Bridge indicates a large amount of cobble material was stored in the past in this slough (Fitting, Personal Communication). The road system effectively cuts off many such storage areas. All the sediment now delivered to the North Fork is confined to the narrow channel and floodplain between the two flanking roads. Out-of-channel sediment storage is limited to the river. Alterations of the floodplain function in many locations have removed the buffering capacity of the channel system. Even after sedimentation rates to the watercourses are reduced dramatically, it will take a substantial period for the current sediment load of the river to be exported or placed in stable deposits.

**2.3.2.5.3. Data Gaps**

The major data gap is the lack of in-stream sediment data. The USGS work (URS Greiner, 2000) was completed for the remedial investigation of metals impacts. This data was very expensive to develop. The development of much additional in-stream data is not expected. Other additional data gaps include the lack of CWE road scores and mass failure data for the North Fork Coeur d'Alene Subbasin. The USFS does not have a process similar to the CWE process nor has it developed a mass failure inventory for the central region of the forest. These data gaps were addressed by the extrapolation of CWE road scores and failure data from watersheds adjacent to the North Fork (see sections 2.3.2.5.1.2.1. and 2.3.2.5.1.2.2.).

**2.3.2.5.4. Potential Sedimentation Mechanisms**

The available data indicate that the stream channel of the North Fork and many of its tributaries has aggraded in the past few decades. The agrading conditions have caused streambed instability to rise to levels that permit in excess of 70% of the bed materials to move during channel altering discharge events (at least bank full or greater discharge). The excessively mobile bed may interfere with salmonid spawning through physical injury to redds and injury to at least the alevin life stage of young trout. In addition, streambed instability fills pools, a critical habitat to trout. The trout densities of the streams have declined. The decline is likely in part due to channel instability and pool filling. The waters are not fully supporting salmonid spawning and cold water biota beneficial uses.

Although the water quality limited listing attributes the limitation to sediment, the available water quality data clearly indicate that streambed instability is at the root of the water quality limitation. Streambed instability is typically caused by increases in the sedimentation or stream power. The potential root parameters of concern for the North Fork are either hydrologic modification or increased sediment yield to the watershed. Since forest harvest activity is the chief land use, it should be studied to ascertain the causes of hydrologic modification and increased sediment yield.

Hydrologic modification and sedimentation are at the root of the water quality limitations of the North Fork and its tributaries. Stream systems dynamically seek balance between sediment transport and stream power. Several hydrologic and sedimentation factors associated with timber harvest and the roads necessary to support harvest can cause imbalance over significant periods. These factors have been discussed by Patten (1996) and are summarized in the following paragraphs.

### 2.3.2.5.4.1. Vegetation Alteration

Water yield from a watershed can be increased or desynchronized due to vegetation removal. Changes in the forest canopy can cause the biggest affect. Vegetation places a transpirational demand on the available soil moisture primarily in the summer months. Vegetation removal frees the phreatic portion of the soil moisture for ground water recharge and, eventually, support of perennial stream flow, typically as base flow. The equivalent of an inch or two of precipitation is made available for stream flow. In addition, tree canopies intercept snow. In their absence snow pack increases. The intercepted snow is more prone to evaporative loss from the watershed. Removal of the canopy locally increases the snow pack available at a later time for runoff. The effect can persist twenty to thirty years until a canopy is fully re-established. Canopy openings may create areas of greater snow accumulation by a second mechanism. Canopy openings foster more turbulent airflow that locally increases snow accumulations. This mechanism functions more readily with colder and drier snow than is typical of most precipitation in the North Fork watershed. Canopy openings also permit re-radiation cooling of the snow pack during nights with clear skies. The cooler snow pack may persist longer into the spring months as a result of nightly cooling until it is shed rapidly in a discharge event during a warm period. The snow pack retained on most slopes of the North Fork watershed is relatively warm since it is produced from only slightly modified maritime fronts. In addition, clear nights are not typical of spring weather in the watershed.

All the impacts of vegetation alteration assume more canopy opening exists at present than compared to the pre-management situation under which the watershed's streams developed. Two management actions that affect the canopy have occurred in the past hundred years. First, the canopy has been opened by timber harvest, especially clear cuts. Nearly 15.5% (88,840 acres/573,695 acres) of the forestland has at least partially hydrologically functional openings, caused by timber harvest. Second, fire, which naturally opened the canopy, has been suppressed for most of the past hundred years. It has been estimated that an average 18% area of the North Fork watershed had an open canopy as a result of fire prior to management (Zack, 1998). The variance about the average is broad (plus or minus 18%). As much as 36% or as little as 0% of the area might have had an open canopy at any given time in the watershed’s history. The current level of canopy opening is well within that estimated prior to management. It unlikely that vegetation alteration itself is contributing significantly to hydrologic modification on a subbasin-wide basis. The flood frequency and history developed in section 2.3.2.1.1. support these conclusions. The mechanisms discussed above may function in first and second order watersheds that have been intensively harvested.

### 2.3.2.5.4.2. Extended Stream Channel Network

Forest harvest in the North Fork watershed has relied on an extensive and intensive road system. Early log skidding systems required roads at hundred yard intervals on slopes. The result is a large number of abandoned or forgotten roads in many of the sub-watersheds.

Precipitation or melting snow normally infiltrates completely in unfrozen forest soils and travels down slope in the shallow ground water system. Forest road cuts typically intercept the shallow ground water flow allowing it to flow either onto the road surface or, in the case of a road with an inside ditch, into that ditch. If the road is out-sloped the water drains back onto undisturbed forest soils and infiltrates. If the road is in-sloped or crowned, the intercepted ground water and drainage from the impervious road surface are concentrated in the inside ditch. The ditch is typically relieved through a drainage culvert. If this relief is onto undisturbed soils, the water infiltrates back to the shallow ground water system. If the ditch transports the drainage to a stream’s contributing area, the water rapidly enters the stream system, in comparison to that moving through the ground water system. The intensive road system of the North Fork watershed repeatedly intercepts the stream system or its contributing area, especially during precipitation or snowmelt events when the contributing area lengthens. The result is an additional increase in a stream's contributing area that may channel water directly to the stream system, where previously the water would have moved slowly through the ground water system. The result can be stream discharge that is greater for a shorter period. During these peak discharges, stream powers are achieved sufficient to move large bed load particles and cut stream banks.

Road crossings and approach areas are the primary areas that enlarge the contributing area of the streams. The modification of the discharge rate caused by the more efficient channeling of water to the stream system is probably contributing to the channel instability during runoff events in first and second order watersheds that have high road densities. The flood frequency and history information developed in section 2.3.2.1.1. do not support these conclusions on a basin wide basis. Discharge from the numerous watersheds of the basin that have different elevations and aspects likely desynchronizes the discharge sufficiently to moderate these effects.

### 2.3.2.5.4.3. Rain on Snow Response

The majority of the North Fork watershed is within the elevation range that has the greatest probability of rain on snow discharge events. Relatively warm maritime fronts can provide rain and vapor that warm the relatively warm snow pack held by the watershed. The soil beneath the pack is often frozen and has low permeability. Under these conditions the watershed yields large volumes to the streams resulting in large stream discharges. Under these conditions, the stream power and channel altering capability are high.

Rain on snow discharge events were and remain a feature of the North Fork watershed. The landform and its stream system developed under this condition. Rain on snow events can magnify other modifications in the watershed because these events develop stream power fully capable of channel alteration. Rain on snow events increase peak flow as the result of road associated increases in the contributing area and increased direct delivery of bed load to the channels.

### 2.3.2.5.4.4. Direct Delivery of Bed Load Materials

Mass wasting of slopes is not a prominent land-forming feature of the North Fork watershed. Many sub-units of the watershed do have a high density of roads. Most of these roads supported earlier logging systems and have been abandoned. Roads are often located in the stream bottoms where they alter stream gradient. In these cases, the stream cuts at its bed and banks attempting to reach dynamic equilibrium. The result is direct delivery of sediment to the stream channels. Road failures, especially at stream crossings and their approaches, can be prevalent on the old logging roads throughout the system. Most entered watersheds have one or more major failures supplying additional bed load to the stream and several minor failures. The stream adjusts its channel to the increased bed load. Channel alterations consist of bank cutting and scour which develop additional bed load. Many streams have reached a point at which the stream is constantly adjusting to the channel changes that occurred during the last channel-forming event. Since the high probability of rain on snow fostered events guarantees channel altering discharges on a regular basis, the streams are in a constant state of instability.

### 2.3.2.5.5. Summary

To a greater or lesser extent, vegetation alteration, extension of the channel network, rain on snow events, and direct delivery of bed load are affecting the hydrology and sedimentation of the North Fork and its tributaries. Direct delivery of bed load from road encroachment into the floodplain, as well as road crossing and crossing approach failures, trigger the initial instability of the stream. Rain on snow events function in two capacities. These events increase sediment delivery and increase stream powers, which develop sufficiently to alter or adjust stream channels. Extension of the stream contributing area by otherwise stable crossings and crossing approaches magnifies the stream discharge during rain on snow or typical snowmelt events. Although vegetation alteration possibly has some transient effect on the hydrology, it is probably small and temporary.

The key pollutant sources are active and abandoned roads located in stream floodplains, crossings, and approaches. These features directly yield sediment to the streams and may essentially increase the contributing area of the streams under snowmelt conditions. The encroaching roads, crossings, and approaches must be remedied in a manner that will make the floodplains function without restriction and road crossings function more as the generally stable slopes of the North Fork watershed.

### 2.3.2.5.6. Additional Non-Sediment Discharge Impacts to the North Fork Watershed

The low fish densities measured in the North Fork are not solely the result of sediment delivery to the streams. The aquatic habitat of the North Fork and its fish species composition has been greatly altered. While a TMDL allocation and implementation plan must address the pollutant of concern, which in this case is sediment, it will not address these important factors. A more holistic approach is necessary to recover fish populations in the North Fork and many of its tributaries.

#### 2.3.2.5.6.1 Stream Channelization

The North Fork, for a long reach between the Silver Bridge to the Enaville Bridge, is in a moderately constrained channel. The stream is isolated from its historic floodplain. Many oxbows of the river are isolated by the current road system. These locations of the floodplain were sediment storage areas prior to development. The river and its increased bed load do not have access to these areas. Bed load that would have been stored in these areas remains in the main channel of the river, often filling pools.

### 2.3.2.5.6.2. Riparian Forest and Large Organic Debris Removal

The riparian forests that flanked the North Fork and the lower reaches of its tributaries were dominated by western red cedar. Even today, the stumps of individual trees that were ten feet thick at their bases can be found in the floodplain along the river. The riparian cedars were an important source of shade and long-enduring large organic debris (LOD). Western red cedar has been harvested from most of the riparian forests. Cottonwoods and young cedars remain along the streams. The source of LOD has been removed from large reaches of the river system.

When lodged in stream, the LOD created a series of sediment traps in the stream system. Sediment was metered through the many LOD sediment traps on its route downstream. The LOD created plunge and scour pools. Since western red cedar is very resistant to decay, its residence time in the stream was long.

The LOD of the streams interfered with their usefulness as routes for commerce. The river was the original route for travel into the North Fork watershed and removal of products from it. As the commercial export of logs on the river began in log drives, the LOD was removed from the river and its larger tributaries (Russell, 1985). Removal of LOD continued as riparian cedar were harvested and persisted until well after the era of log drives had concluded. After a 1974 flood, the USFS implemented a program of LOD removal as part of its timber harvest program. The purpose of the activity was to remove the interference of LOD with flood flows. It was only during the mid-1980s that the importance of LOD in-stream was recognized by managers and the removal practices ended.

The result of riparian cedar harvest and LOD removal is pervasive in the North Fork watershed. An important feature of the streams that created pool habitat and likely metered the movement of large sediment through the watershed has been effectively removed. The impact to the habitat of the fishery is dramatic. There is a parallel impact to sediment export. If its LOD component was intact, attenuation of the sediment loads may have been more efficient. More sediment yield reduction may be necessary under the current conditions than would have been with an intact system of LOD.

### 2.3.2.5.6.3. Introduction of Non-native Fish Species

Several fish species have been introduced to Coeur d'Alene Lake and River (DEQ, 1995), Most of these remain in the waters of the lake, river, and its lateral (chain) lakes, but introduced Chinook and some Kokanee salmon spawn in the tributary rivers. Chinook salmon spawn in the lower reaches of the North Fork. Kokanee minnows have been documented in the upper reaches of the South Fork (Hartz, 1993a). Although no presence of Kokanee in the North Fork has been documented, some Kokanee may spawn in some North Fork tributaries.

The important introduced fish species of the North Fork are rainbow and brook trout. Rainbow trout may be found in the river and some lower reaches of its tributaries. Rainbow populations appear to be low based on the existing fish census data. Brook trout appear restricted to the Beaver Creek and Prichard Creek watershed. Brook trout populations in Beaver Creek are quite high. Except for Beaver Creek, native cutthroat trout dominate the fish census data. Bull trout are nearly extirpated from the North Fork. A remnant population may spawn in Graham Creek. The impact of the non-native fish on the native populations in the streams of the North Fork is not understood.

**2.3.2.5.6.4. Summary**

Habitat alterations and introduction of non-native fish are in part related to the low populations of native fish in the streams. Channelization of the stream and removal of LOD not only remove the potential for habitats important to fish, but also the ability of the streams to attenuate increases in sediment yield. A TMDL can only address pollutants of concern, which, in this case, are metals and sediment. However, the implementation plan, drawn up to achieve the sediment allocations of the TMDL, can and should address these other problems in a more holistic manner. Investments in measures that would add LOD to the stream system and remove the constrictions of channelization would create a stream able to attenuate a higher sediment yield than the stream system depleted of these features. The result would likely be full support of the beneficial use at a higher level of sediment yield.

## 2.3.3 Beneficial Use Support Status

Water bodies were not assessed for flow or habitat alteration. Current DEQ policy does not recognize flow and habitat alteration as quantifiable and therefore allocatable parameters. The assessed support status of the water bodies based on the data available is provided in Table 19. For each water body, the reasons why certain TMDLs are needed are noted.

Sediment TMDLs are warranted for all segments listed, except Beaver Creek where fish density and residual pool volume are similar to the reference streams. Some segments requiring sediment TMDLs are located at the base of the watershed (1701030 3481). Since this is the case, sedimentation of the reach occurs as the result of sediment yields throughout the watershed. The sediment TMDL will address the entire North Fork Coeur d’Alene watershed.

Little evidence exists to suggest that bacteria, nutrients, dissolved oxygen, or oil and grease are impairing the water quality of Prichard Creek. Analyses of samples for bacteria, nutrients, and oil and grease have been below detection. Dissolved oxygen measurements have been well above the standard of 6 mg/L. Metals standards exceedances have been detected in the East Fork Eagle, Prichard, and Beaver Creeks. The Jack Waite mine and mill site in an upstream tributary of East Fork Eagle Creek is most likely responsible for the metals standards exceedances of this water body. The Paragon, Monarch, Terrible Edith, Bear, and Ione mine and mill sites are potentially responsible for the metals standards exceedances of Prichard Creek. The Ray Jefferson mill site appears to be responsible for the metals standards exceedances of Beaver Creek. Total maximum daily loads will be required to address metals standards exceedances in East Fork Eagle, Prichard, and Beaver Creeks. Beaver Creek is currently not listed. It should be listed in 2002.

Table 19: Results of Water Body Assessment Based on Application of the Available Data

| Stream | HUC Number | Boundaries | Assessed Support Status | Reasons TMDL[1] not Required for Pollutant(s) |
|---|---|---|---|---|
| North Fork Coeur d'Alene River | 17010301 3482 | Tepee Creek to Yellowdog Creek | impaired by sediment | N/A[2] |
| Tepee Creek | 17010301 3508 | Headwaters to Big Elk Creek | impaired by sediment | N/A |
| Big Elk Creek | 17010301 3511 | Headwaters to Tepee Creek | impaired by sediment | N/A |
| Calamity Creek | 17010301 5034 | Headwaters to Jordan Creek | impaired by sediment | N/A |
| Cub Creek | 17010301 5054 | Headwaters to Lost Fork Creek | impaired by sediment | N/A |
| Yellowdog Creek | 17010301 3506 | Headwaters to North Fork Cd'A River | impaired by sediment | N/A |
| Shoshone Creek | 17010301 3504 | Sentinel Creek to North Fork Cd'A River | impaired by sediment | N/A |
| Lost Creek | 17010301 5643 | Headwaters to North Fork Cd'A River | impaired by sediment | N/A |
| Falls Creek | 17010301 7504 | Headwaters to Shoshone Creek | impaired by sediment | N/A |
| Beaver Creek | 17010301 3499 | Headwaters to North Fork Cd'A River | impaired by metals | fish / residual pool volume data indicated full support for sediment |
| Prichard Creek | 17010301 3500 | Barton Gulch to North Fork Cd'A River | impaired by sediment and metals | no evidence of bacteria, DO, nutrient and oil and grease exceedances |
| East Fork Eagle Creek | 17010301 5617 | Headwaters to Eagle Creek | impaired by sediment and metals | no support for pH impairment |
| Cougar Gulch | 17010301 7501 | Headwaters to Pritchard Creek | impaired by sediment | N/A |
| North Fork Coeur d'Alene River | 17010301 3481 | Yellowdog Creek to South Fork Cd'A River | impaired by sediment | N/A |
| Steamboat Creek | 17010301 3495 | Barrymore Creek to North Fork Cd'A River | impaired by sediment | N/A |
| Little North Fork Coeur d'Alene River | 17010301 3485 | Headwaters to Laverne Creek | impaired by sediment | N/A |
| Copper Creek | 17010301 3487 | Headwaters to Little North Fork Cd'A River | impaired by sediment | N/A |
| Burnt Cabin Creek | 17010301 5032 | Headwaters to Little North Fork Cd'A River | impaired by sediment | N/A |

1. total maximum daily load; 2. not applicable

## 2.4. Pollution Control

### 2.4.1 Control Actions to Date

Metals control actions have begun in the Prichard and Beaver Creek watersheds. A consent decree has been developed between the USFS, ASARCO, and Jack Waite Mining Company to complete an environmental evaluation and cost analysis of the mine and mill site. The study should lead to a plan to clean up the site and remove the metals source. The USFS has developed plans to remove the Paragon Mill site on Prichard Creek. The clean-up plan is scheduled for implementation in summer 2002. The Monarch Mill site on private land has been targeted by DEQ for removal actions. Application has been made for funds to address the site. If funding efforts are successful, the site would be slated for remedial actions during summer 2003. The USFS and several cooperating agencies continue to study the sources of metals contamination in the Prichard and Beaver Creek watersheds in an effort to identify these sources for remedial actions.

The primary land manager of the North Fork watershed is the USFS. The USFS has observed the deteriorating condition of the streams, documented the in-stream effects, and recognized the remedial actions needed to start the watersheds towards recovery. Road inventories have been developed in and around timber sale areas for several years. A detailed inventory has been developed for the Tepee Creek watershed. Since most of these inventories exist as a parts of project files and are difficult to access and use in this form, the USFS has placed the information in an interactive GIS format. In this form, the road inventory information is available to pinpoint and develop priorities for road removal and to identify crossings and approaches requiring remedial work.

The USFS has undertaken road rehabilitation work in the North Fork watershed. Intensive road rehabilitation and removal actions have been completed in the Autumn and Martin sub-watersheds of the Steamboat Creek watershed. Similar actions have occurred in Shoshone Creek watershed. These activities were supported by the Knutson-Vandermeir (KV) funds from timber sales or special appropriations. Appropriations for rehabilitation work are becoming more scarce as the federal budget is constrained, while KV funds may only be used in the immediate vicinity of the timber sale which develops them. These two factors have curtailed the extensive amount of watershed rehabilitation work needed to recover the beneficial uses of the North Fork. The USFS program has sought to obliterate entire roads. Recent analysis indicates roads cause sediment loading primarily near road crossings of streams and where roads are located within the stream floodplain causing gradient changes. The scarce funds obtained by the USFS are now targeted on the sediment yield areas rather than on obliterating the entire road. The USFS has budgeted $1.2 million per year to address road problems in the North Fork over the past few years.

### 2.4.2. Pollution Control Strategy

The metals pollution control strategy is based on the state’s remedial plan for the Coeur d’Alene Basin. The state’s alternative clean up plan (alternative 5) for the feasibility study included actions for Beaver, East Fork Eagle and Prichard Creeks. The North Fork Coeur d’Alene River tributaries have been included in the draft five-year clean up plan. Remedial work required in the North Fork watersheds should be complete in five to ten years and standards met within fifteen years.

The key to breaking the cycle of bed load delivery and channel instability, which impairs the beneficial uses of the North Fork and its tributaries, is removal of roads from flood plains and rehabilitation of the road crossings and approaches which deliver excess water and sediment to the streams. Roads encroaching on stream crossings require removal on abandoned roads where practical. Stream crossings generally require that the fill be removed from the stream corridor and from stream conveyance structures (culverts). Approaches need to be out-sloped to shed water to undisturbed soils where they may infiltrate, ripped to promote infiltration rather than runoff from the road surface, and covered with grass to prevent erosion. Where approaches have fills that could fail to the stream, the fill should be pulled back and stabilized. This work can be completed with the road graders, earthmovers, and backhoes typically used for timber road construction.

The federal and state governments may have insufficient funding resources to adequately address the problem in the current budgetary climate. Based on the current USFS budget, it will take many years to address the backlog of abandoned road and stream crossing removals. Grants from environmental or corporate foundations and federal programs should be explored as alternate sources of funds. The section 319 CWA program is the largest source of funds for nonpoint source water pollution remedial projects. Annually, Idaho receives $3.5 million from the federal government for funding of nonpoint source improvement projects. In the past year, nearly $5.5 million in proposed projects competed for these funds statewide. The average grant, exclusive of the 40% local matching amount, is $150,000. This very large federal nonpoint source pollution control program would currently provide only a marginal boost to the current USFS appropriations.

The timber industry must operate at a profit to exist and is not likely to address the problem in a “pro bono” program. Neither government nor industry can address the problem alone, but working together cooperatively may be able to address the crossing and approach issue. The federal government does have the timber resource, which is the raw material needed to operate the timber industry. This pollution control strategy takes a position neither for or against the harvest of timber. These are decisions reserved to land managers and owners. However, if new timber harvest is approved and requires new access roads, these new roads will cross water bodies requiring approaches as well as a crossing structure. Construction of these crossings would be required to meet minimum state of the art specifications prescribed in the Idaho Forest Practices Rules and Regulations. In addition, a control strategy could require that a certain number of pollution credits would be required to construct any stream crossing. This number could be greater than one and be dependent on the burden of abandoned crossings and encroaching roads, which require remedial work in the sub-watershed. Credits could be earned by the rehabilitation of abandon stream crossings and encroaching roads in the sub-watershed unit. Only after sufficient credits were earned to permit the new road, could its construction be permitted.

Under this strategy, the USFS could provide the list and priority of the crossings and encroaching roads requiring remedial work and road removal in a sub-watershed. These lists could be made sufficiently broad to provide timber contractors with maximum flexibility. The timber contractors could complete the remedial work to the satisfaction of the USFS with the equipment they typically have on hand for forest road construction. As sufficient credits were developed, any required new roads would be developed and after harvest, retired. Over time, this operational strategy should move the impaired streams back toward stability and permit the recovery of the fishery uses. At some point, the backlog of abandoned road crossings requiring remedial work would be exhausted and the pollution credit ratio would collapse to one.

# 3. Total Maximum Daily Loads for Water Quality Limited Water Bodies of the North Fork Coeur d'Alene River Subbasin (17010301)

Section 303(d)(1) of the Clean Water Act requires states to prepare a list of waters not meeting state water quality standards in spite of technology-based pollution control efforts and the application of best management practices for nonpoint sources. This list must include a priority ranking "... taking into account severity of the pollution and the uses to be made of such waters." The prescribed remedies for these water quality limited waters is for states to determine the TMDL for pollutants "... at a level necessary to implement applicable water quality standards with seasonal variations and a margin of safety..." A margin of safety is included to account for any lack of knowledge about how limiting pollutant loads will affect water quality.

Section 303(d)(2) requires both the list and any TMDLs developed by a state be submitted to the EPA. The EPA is given 30 days to either approve or disapprove the state's submission. If the EPA disapproves, the state has another 30 days to develop a new list or TMDL. The list and all TMDLs, either approved or developed by the EPA, are incorporated into each state's continuing planning process as required by section 303(e).

## 3.1 Total Maximum Daily Load for the Sediment Limited Segments of the North Fork Coeur d'Alene River

### 3.1.1 Introduction

The North Fork Coeur d'Alene River has many segments and tributaries impaired by sediment including the lowest reach of the watershed: the North Fork between Yellowdog Creek and the North Fork's mouth. Even those segments not impaired most often contribute to sediment load. The most logical approach to a watershed so pervasively destabilized is to develop a TMDL that addresses stream sedimentation in the entire watershed.

### 3.1.2 Segments Addressed

The Subbasin assessment of the North Fork Coeur d'Alene River lists 17 segments as water quality limited by sediment. The 1996 303(d) list contained an additional 16 segments that were delisted in 1998, but contribute sediment to listed downstream segments (Tables 20 and 21).

Table 20: Sediment Impaired Stream Segments of the North Fork Coeur d'Alene Watershed

| Stream | HUC[1] Number | Boundaries | Assessed Support Status |
|---|---|---|---|
| North Fork Coeur d'Alene River | 17010301 3482 | Tepee Creek to Yellowdog Creek | impaired by sediment |
| Tepee Creek | 17010301 3508 | Headwaters to Big Elk Creek | impaired by sediment |
| Big Elk Creek | 17010301 3511 | Headwaters to Tepee Creek | impaired by sediment |
| Calamity Creek | 17010301 5034 | Headwaters to Jordan Creek | impaired by sediment |
| Cub Creek | 17010301 5054 | Headwaters to Lost Fork | impaired by sediment |
| Yellowdog Creek | 17010301 3506 | Headwaters to North Fork Coeur d'Alene River | impaired by sediment |
| Shoshone Creek | 17010301 3504 | Sentinel Creek to North Fork Coeur d'Alene River | impaired by sediment |
| Lost Creek | 17010301 5643 | Headwaters to North Fork Coeur d'Alene River | impaired by sediment |
| Falls Creek | 17010301 7504 | Headwaters to Shoshone Creek | impaired by sediment |
| Prichard Creek | 17010301 3500 | Barton Gulch to North Fork Coeur d'Alene River | impaired by sediment and metals |
| East Fork Eagle Creek | 17010301 5617 | Headwaters to Eagle Creek | impaired by sediment and metals |
| Cougar Gulch | 17010301 7501 | Headwaters to Prichard Creek | impaired by sediment |
| North Fork Coeur d'Alene River | 17010301 3481 | Yellowdog Creek to South Fork Coeur d'Alene River | impaired by sediment |
| Steamboat Creek | 17010301 3495 | Barrymore Creek to North Fork Coeur d'Alene River | impaired by sediment |
| Little North Fork Coeur d'Alene River | 17010301 3485 | Headwaters to Lavern Creek | impaired by sediment |
| Copper Creek | 17010301 3487 | Headwaters to Little North Fork Coeur d'Alene River | impaired by sediment |
| Burnt Cabin Creek | 17010301 5032 | Headwaters to Little North Fork Coeur d'Alene River | impaired by sediment |

[1] hydrologic unit code

Table 21: Streams Segments Delisted in the 1998 Process but Contributing Sediment to Downstream Sediment Impaired Segments

| Stream | HUC[1] Number | Boundaries | Pollutants |
|---|---|---|---|
| Cinnamon Creek | 17010301 5042 | Headwaters to North Fork Coeur d'Alene River | sediment |
| Flat Creek | 17010301 3507 | Headwaters to North Fork Coeur d'Alene River | sediment |
| Lost Fork Creek | 17010301 5115 | Headwaters to Jordan Creek | sediment |
| Trail Creek | 17010301 3510 | Headwaters to Tepee Creek | sediment |
| West Fork Eagle Creek | 17010301 3501 | Headwaters to Eagle Creek | sediment |
| Wesp Gulch | 17010301 7502 | Headwaters to Prichard Creek | sediment |
| Tiger Gulch | 17010301 7500 | Headwaters to Prichard Creek | sediment |
| Ophir Gulch | 17010301 7500 | Headwaters to Prichard Creek | sediment |
| Idaho Gulch | 17010301 7505 | Headwaters to Prichard Creek | sediment |
| Barton Gulch | 17010301 5008 | Headwaters to Granite Gulch | sediment |
| Downey Creek | 17010301 3505 | Headwaters to North Fork Coeur d'Alene River | sediment |
| Barney Creek | 17010301 5007 | Headwaters to Little North Fork Coeur d'Alene River | sediment |
| Skookum Creek | 17010301 3490 | Headwaters to Little North Fork Coeur d'Alene River | sediment |
| Leiberg Creek | 17010301 3489 | Headwaters to Little North Fork Coeur d'Alene River | sediment |
| Lavern Creek | 17010301 3488 | Headwaters to Little North Fork Coeur d'Alene River | sediment |
| Bumblebee Creek | 17010301 3486 | Headwaters to Little North Fork Coeur d'Alene River | sediment |

[1] hydrologic unit code

### 3.1.3 Points of TMDL Compliance

Mapping the segments in Table 20 demonstrates that the most downstream segments of the Middle North Fork, Shoshone-Lost, Prichard, and Lower North Fork sub-watersheds are sediment impaired. The Tepee Creek sub-watershed is impaired above the Independence Creek confluence, while the Little North Fork watershed is impaired above the Lavern Creek confluence. Mapping the segments in Table 21 shows these segments are tributaries to sediment-impaired downstream segments of all the sub-watersheds except for the Little North Fork sub-watershed. However, three segments are tributaries to the most downstream reach of the Little North Fork sub-watershed. Although this segment is not sediment limited, it contributes to the lower North Fork segment that is sediment limited.

The North Fork Coeur d'Alene River drains a large watershed. For convenience of monitoring compliance with the TMDL, points of compliance must be selected. Based on the discussion above, the points of compliance with the TMDL are:

- North Fork Coeur d'Alene River immediately above the Tepee Creek confluence
- Tepee Creek immediately above its the North Fork confluence
- North Fork Coeur d'Alene River immediately below the Yellowdog Creek confluence
- Shoshone Creek at its mouth
- Lost Creek at its mouth
- Prichard Creek at its mouth
- Beaver Creek at its mouth
- Little North Fork Coeur d'Alene River at its mouth
- North Fork Coeur d'Alene River at its mouth.

### 3.1.4 Loading Capacity

The load capacity for a TMDL designed to address a sediment-caused limitation to water quality is complicated by the fact that the state's water quality standard is a narrative rather than a quantitative standard. In the waters of the North Fork Coeur d'Alene River watershed, the sediment interfering with the beneficial use (cold water biota) is most likely large bed load particles. Fine sediment may interfere with the salmonid spawning beneficial use. Adequate quantitative measurements of the effect of excess sediment have not been developed. Given this difficulty, a sediment loading capacity for the TMDL is difficult to develop. This TMDL and its loading capacity is based on the following premises:

- sediment yield below 50% above background will fully support the beneficial uses of cold water biota and salmonid spawning,

- the stream system has some finite yet not quantified ability to process (attenuate through export and/or deposition) a sediment yield rate greater than 50% above background rates,

- beneficial uses (cold water biota and salmonid spawning) will be fully supported when the finite yet not quantified ability of the stream system to process (attenuate) sediment is met, and

- care must be taken to control factors, such as fish harvest, that may interfere with the quantification of beneficial use support.

The natural background sedimentation rate was calculated by multiplying the watershed acreage above a certain point by the sediment yield coefficient for coniferous forests (0.023 tons/acre/year). The estimate assumes the entire watershed is vegetated by coniferous forest. The calculated estimated value for the entire North Fork is 13,089 tons per year. Thus, the 50% above background sediment yield goal is 19,633 tons per year for the entire watershed. This goal is supported by the sediment yield rate of 42.8% above background modeled for the Upper North Fork Coeur d'Alene River Subbasin (See Table 18). The upper North Fork Subbasin contains the streams used as controls (Buckskin, Spruce, and the North Fork), which have high residual pool volumes (See Table 13) and fish densities (See Table 14). The goal of 19,933 tons per year is an estimated goal that will be replaced by the final sediment goal, when the criteria for full support of cold water biota and salmonid spawning designated in section 3.1.6 are met. The loading capacities based on the projected goal at each point of compliance are provided in Table

22. Loading capacities were developed by calculating background sedimentation based on acreage above the point of compliance. An additional 50% of the value was added to develop the loading capacity.

Table 22: Loading Capacity at the Points of Compliance

| Location | Acreage of watershed | Loading Capacity at 50% above background (tons/year) |
|---|---|---|
| North Fork Coeur d'Alene River immediately above the Tepee Creek confluence | 66,050 | 2,279 |
| Tepee Creek immediately above the North Fork Coeur d'Alene River confluence | 91,576 | 3,159 |
| North Fork Coeur d'Alene River immediately below the Yellowdog Creek confluence | 198,924 | 6,863 |
| Shoshone Creek at its mouth | 44,755 | 1,544 |
| Lost Creek at its mouth | 14,477 | 499 |
| Prichard Creek at its mouth | 63,254 | 2,182 |
| Beaver Creek at its mouth | 27,716 | 984 |
| Little North Fork Coeur d'Alene River at its mouth | 108,182 | 3,746 |
| North Fork Coeur d'Alene River at its mouth | 569,082 | 19,884 |

### 3.1.5 Margin of Safety

The model, employed to estimate sediment yield rates, has several conservative assumptions, which are documented in Appendix C. Applied to the Belt terrain of the North Fork Coeur d'Alene watershed, the model provides a margin of safety of 231%. This is a sufficient margin of safety.

### 3.1.6 Appropriate Measurements of Full Beneficial Use Support

Sediment load reduction from the current level toward the 50% above background sediment yield reduction goal is expected to attain a sediment load that is not yet quantified, but will fully support beneficial uses (cold water biota and salmonid spawning). This sediment load will be recognized by the following appropriate measures of full cold water biota support:

- three or more age classes of trout, including young of the year,
- trout density levels of 0.1-0.3 fish/square meter,
- presence of sculpin and tailed frogs, and
- a macro-invertebrate biotic index score of 3.5 or greater.

When the final sediment loading capacity is determined by these appropriate measures of full cold water biota and salmonid spawning support, the TMDL will be revised to reflect the established supporting sediment yield.

### 3.1.7 Sediment Waste Load Allocation

There are no point discharges of sediment to the North Fork Coeur d'Alene River watershed. No waste load allocation is necessary to address discrete sources.

### 3.1.8 Sediment Load Allocation

The load allocation is made to the numerous nonpoint sources to the North Fork watershed. These are cataloged on GIS files used to develop the sediment model. The entire loading capacity is applied at each tributary point of compliance. For those points, where upstream tributaries contribute to the loading capacity, the upstream allocations are removed from the loading capacity and the residual is allocated to the watershed immediate to the point of compliance. Allocations are based on management/ownership percentages for the immediate watershed.

#### 3.1.8.1 Upper North Fork Coeur d'Alene River Subbasin

The sediment load allocation for the Upper North Fork Subbasin is shown in Table 23 and Figure 6.

Table 23: Upper North Fork Subbasin Sediment Allocation

| Owner Manager | Acreage | Percentage | Sediment Allocation (tons/year) |
|---|---|---|---|
| U.S. Forest Service | 65,907 | 99.8 | 2,274 |
| Private | 143 | 0.2 | 5 |

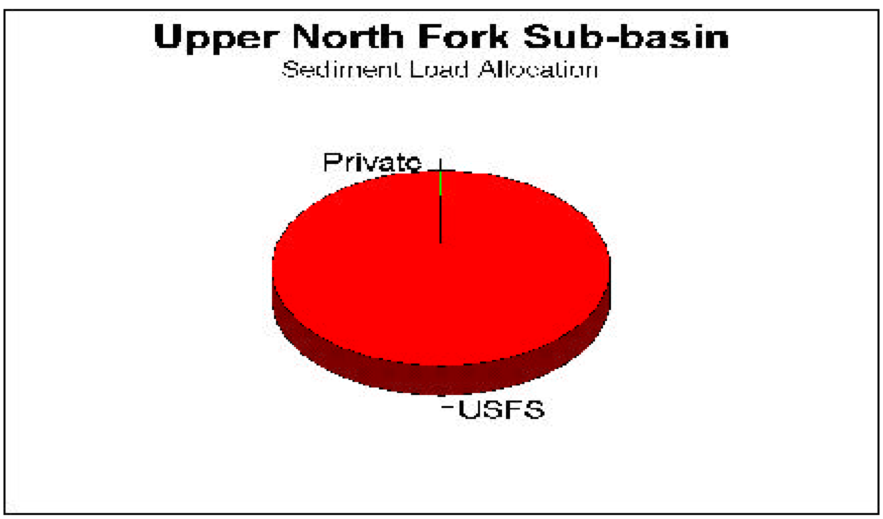



Figure 6 Sediment allocation for the Upper North Fork Coeur d'Alene River Subbasin

### 3.1.8.2 Tepee Subbasin Allocation

The sediment load allocation for the Tepee Creek Subbasin is shown in Table 24 and Figure 7.

Table 24: Tepee Subbasin Sediment Allocation

| Owner Manager | Acreage | Percentage | Sediment Allocation (tons/year) |
|---|---|---|---|
| **U.S. Forest Service** | 90,980 | 99.3 | 3,137 |
| Private | 596 | 0.7 | 22 |

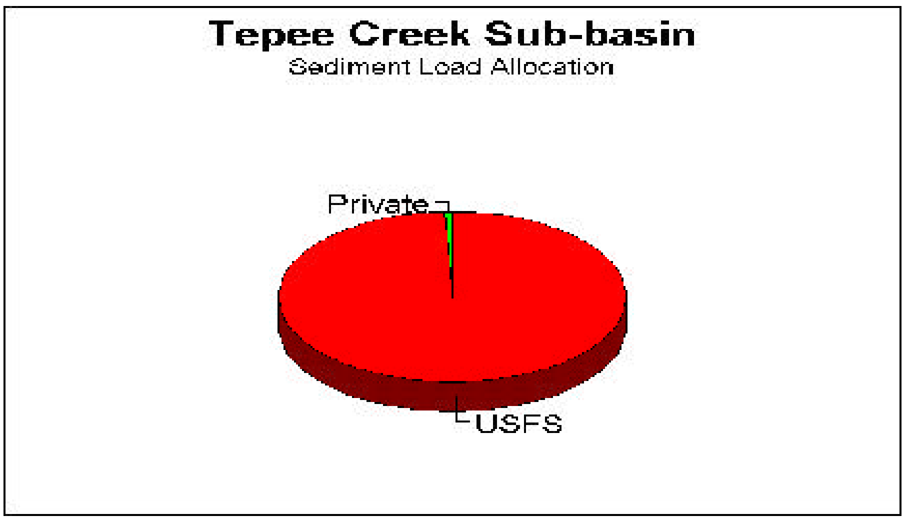



Figure 7 Sediment allocation for the Tepee Creek Subbasin

### 3.1.8.3 Middle North Fork Coeur d'Alene River Subbasin Allocation

The Middle North Fork Subbasin receives discharge and sediment from the Upper North Fork and Tepee Subbasins. The background or 50% above background loads previously allocated to these Subbasins must be subtracted from the respective goals at the Middle North Fork point of compliance. The allocatable load to the Middle North Fork sub basin is 1,425 (6,863-(2,279+3,159). The sediment load allocation for the Middle North Fork Subbasin is shown in Table 25 and Figure 8.

Table 25: Middle North Fork Subbasin Sediment Allocation

| Owner Manager | Acreage | Percentage | Sediment Allocation (tons/year) |
|---|---|---|---|
| **U.S. Forest Service** | 41,138 | 99.6 | 1,419 |
| Private | 160 | 0.4 | 6 |

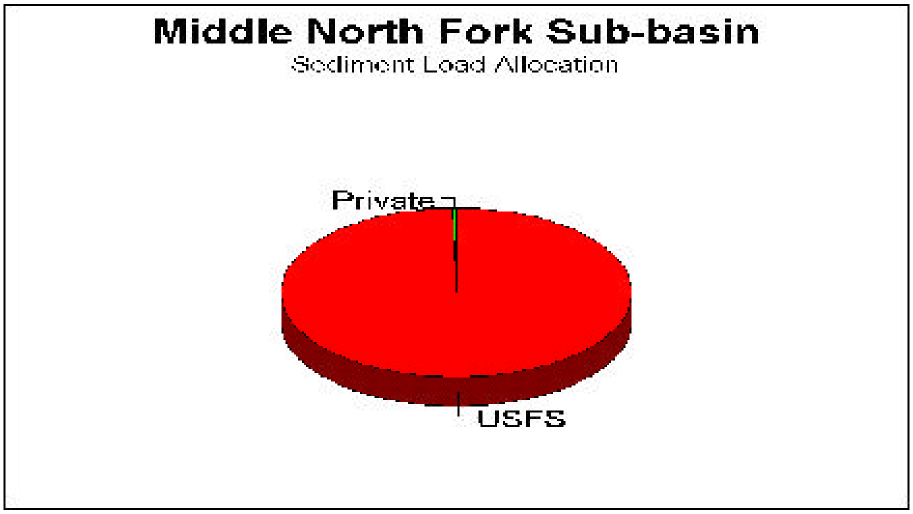



Figure 8 Sediment allocation for the Middle North Fork Coeur d'Alene River Subbasin

### 3.1.8.4 Shoshone and Lost Creek Sub-basins Allocations

The USFS manages the Shoshone and Lost Creek watersheds. The allocations of both subbasins are allocated to the single ownership. The sediment load allocations for the Shoshone and Lost Creek Subbasins are shown in Table 26 and Figures 9 and 10.

Table 26: Shoshone and Lost Subbasins Sediment Allocations

| Owner Manager | Acreage | Percentage | Sediment Allocation (tons/year) |
|---|---|---|---|
| Shoshone Creek U.S. Forest Service | 44,755 | 100 | 1,544 |
| Lost Creek U.S. Forest Service | 14,477 | 100 | 499 |

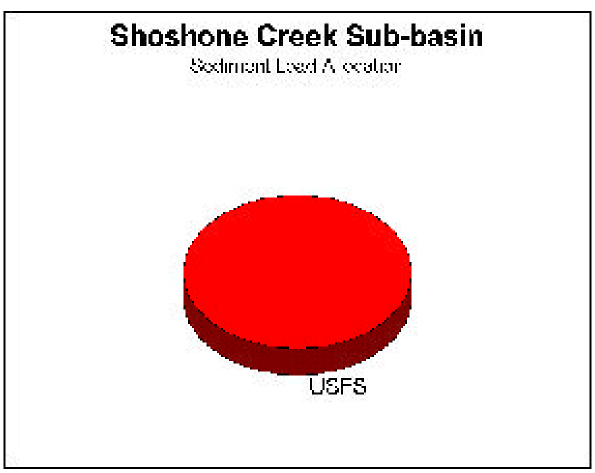



Figure 9 Sediment allocation for the Shoshone Creek Subbasin

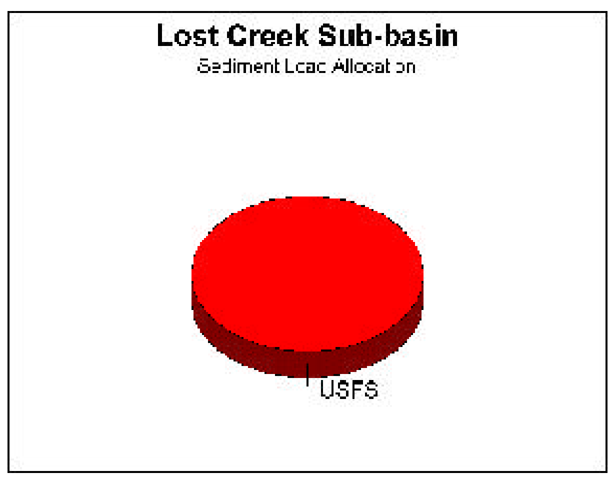



Figure 10 Sediment allocation for the Lost Creek Subbasin

### 3.1.8.5 Prichard Creek Subbasin Allocation

The sediment load allocation for the Prichard Subbasin is shown in Table 27 and Figure 11.

Table 27: Prichard Subbasin Sediment Allocation

| Owner Manager | Acreage | Percentage | Sediment Allocation (tons/year) |
|---|---|---|---|
| **U.S. Forest Service** | 54,263 | 85.8 | 1,872 |
| Private | 5,957 | 9.4 | 206 |
| U.S. Bureau of Land Management | 2,574 | 4.1 | 89 |
| Louisiana Pacific | 460 | 0.7 | 15 |

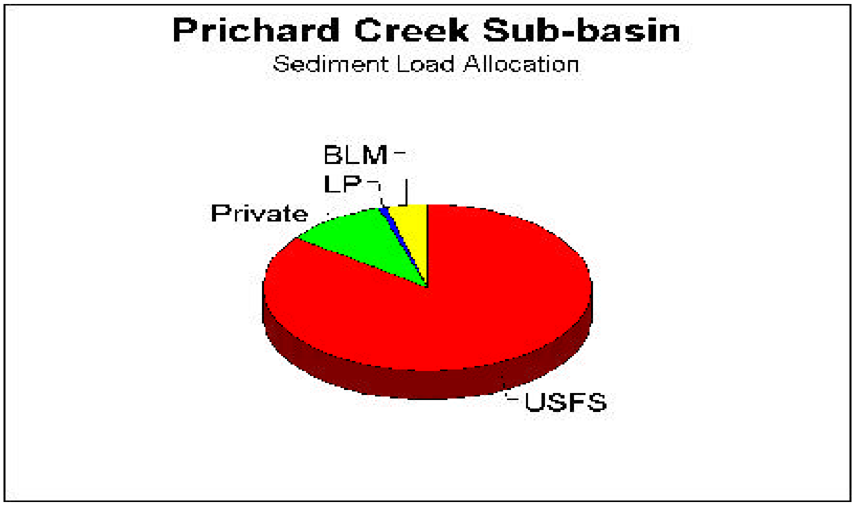



Figure 11 Sediment allocation for the Prichard Creek Subbasin

### 3.1.8.6 Beaver Creek Subbasin Allocation

The sediment load allocation for the Beaver Creek Subbasin is shown in Table 28 and Figure 12.

Table 28: Beaver Subbasin Sediment Allocation

| Owner Manager | Acreage | Percentage | Sediment Allocation (tons/year) |
|---|---|---|---|
| U.S. Forest Service | 24,976 | 87.6 | 863 |
| Private | 2,740 | 4.8 | 48 |
| Louisiana Pacific | 1,360 | 4.6 | 45 |
| U.S. Bureau of Land Management | 805 | 2.8 | 28 |

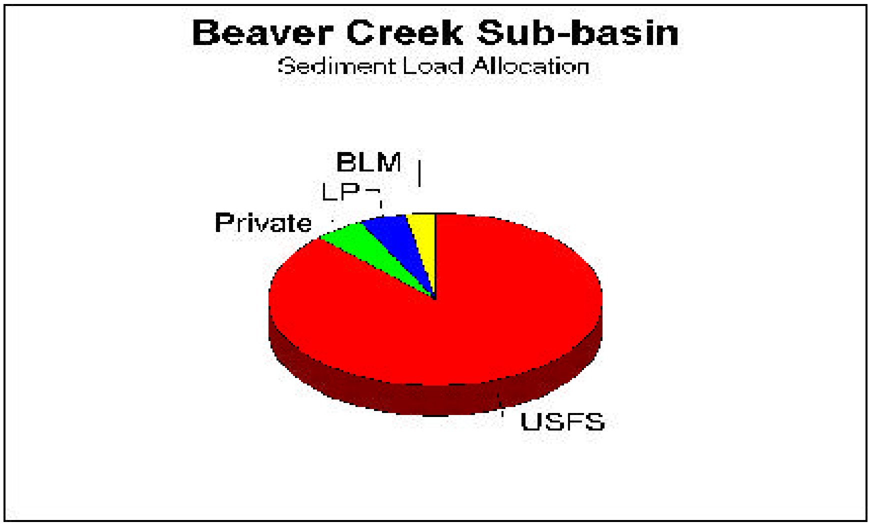



Figure 12 Sediment allocation for the Beaver Creek Subbasin

### 3.1.8.7 Little North Fork Coeur d'Alene River Subbasin Allocation

The sediment load allocation for the Little North Fork Coeur d'Alene River Subbasin is shown in Table 29 and Figure 13.

Table 29: Little North Fork Coeur d'Alene River  Subbasin Sediment Allocation

| Owner Manager | Acreage | Percentage | Sediment Allocation (tons/year) |
|---|---|---|---|
| **U.S. Forest Service** | 107,033 | 98.5 | 3,690 |
| Private | 1,545 | 1.4 | 53 |
| Idaho Department of Lands | 76 | 0.1 | 3 |

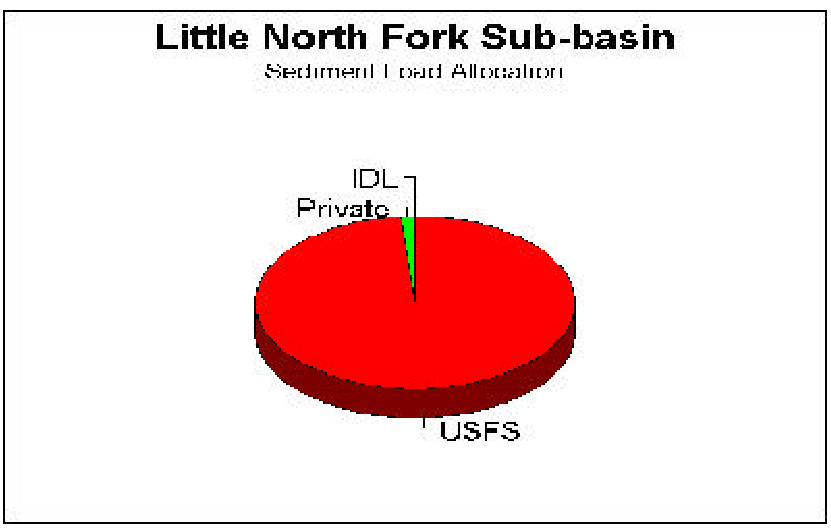



Figure 13 Sediment allocation for the Little North Fork Coeur d'Alene River Subbasin

### 3.1.8.8 Lower North Fork Coeur d'Alene River Subbasin Allocation

The lower North Fork Subbasin has several subbasins that discharge to it. The sediment allocations to these upstream subbasins are subtracted from the loading capacity of the lower North Fork. The resulting allocatable load is 4,063 tons per year for the goal 50% above background sediment yield goal (19,884 t/yr - (6,863 t/yr + 1,544 t/yr + 499 t/yr + 2,182 t/yr + 984 t/yr + 3,690 t/yr). The sediment load allocation for the Lower North Fork Coeur d'Alene River Subbasin is shown in Table 30 and Figure 14.

Table 30: Lower North Fork Coeur d'Alene River Subbasin Sediment Allocation

| Owner Manager | Acreage | Percentage | Sediment Allocation (tons/year) |
|---|---|---|---|
| U.S. Forest Service | 93,979 | 79.8 | 3,242 |
| Private | 14,551 | 12.4 | 502 |
| Idaho Department of Lands | 9,233 | 7.8 | 319 |

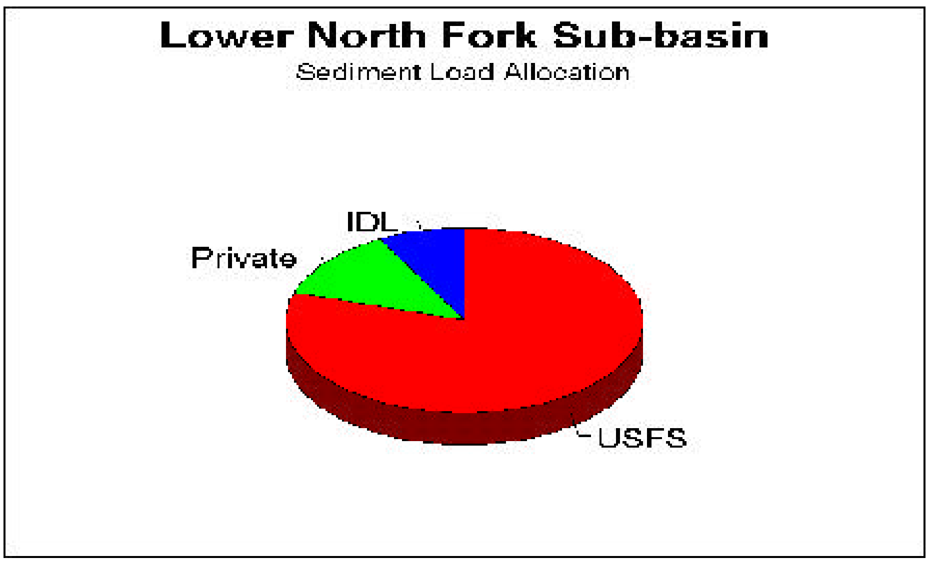



Figure 14 Sediment allocation for the Lower North Fork Coeur d'Alene River Subbasin

### 3.1.8.9 Summation North Fork Coeur d'Alene River Subbasin Allocation

The sediment load allocation summation for the North Fork Coeur d'Alene River Subbasin is shown in Table 31 and Figure 15.

Table 31: North Fork Coeur d'Alene River Subbasin Sediment Allocation

| Owner Manager | Acreage | Percentage | Sediment Allocation (tons/year) |
|---|---|---|---|
| U.S. Forest Service | 537,508 | 93.3 | 18,490 |
| Private | 26,152 | 4.5 | 900 |
| Idaho Department of Lands | 9,309 | 1.6 | 320 |
| U.S. Bureau of Land Management | 3,379 | 0.6 | 116 |
| Louisiana Pacific | 1,680 | 0.3 | 58 |

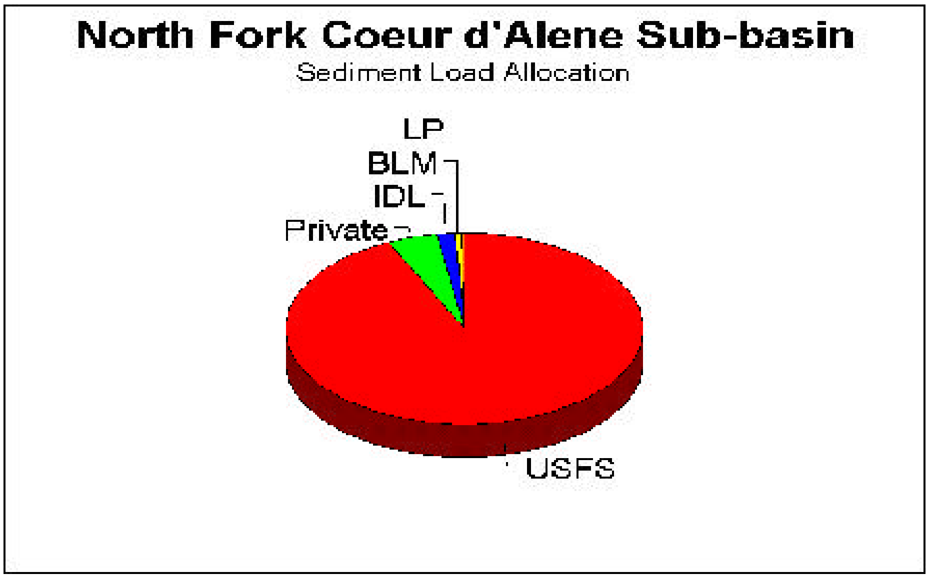



Figure 15 Sediment allocation for the North Fork Coeur d'Alene River Subbasin

### 3.1.9 Sediment Load Reductions Required

Management agencies and private owners are less interested in the sediment allocation than in the sediment reduction required from the lands they manage or own. The necessary sediment load reductions are based on the sediment model results and the sediment goals. Table 32 lists the necessary sediment reductions for each Subbasin to reach the goals of background sedimentation and 50% above background sedimentation. The level of reduction required by any individual management agency or landowner in any of the basins is governed by the percentage of land owned or managed. The table shows the reduction required in each subbasin with the numbers in parenthesis indicating the modeled load minus the sediment goal.

Table 32: Sediment Load Reductions Required to meet TMDL Goals for the Subbasins of the North Fork Coeur d'Alene River

| Subbasin | Sediment Reduction Required (tons/year) |
|---|---|
| Upper North Fork Coeur d'Alene River | 0 (2,257 - 2,279) |
| Tepee Creek | 477 (3,636 - 3,159) |
| Middle North Fork Coeur d'Alene River | 829 (2,254 - 1,425) |
| Shoshone Creek | 624 (2,168 - 1,544) |
| Lost Creek | 22 (521 - 499) |
| Prichard Creek | 1,000 (3,182 - 2,182) |
| Beaver Creek | 704 (1,688 - 984) |
| Little North Fork Coeur d'Alene River | 2,899 (6,645 - 3,746) |
| Lower North Fork Coeur d'Alene River | 3,856 (7,919 - 4,063) |
| Total Reductions | 10,486 (30,370 - 19,884) |

### 3.1.10 Monitoring Provisions

In-stream monitoring of the beneficial use (cold water biota and salmonid spawning) support status during and after implementation of sediment abatement projects will establish the final sediment load reduction required by the TMDL. In-stream monitoring, which will determine if the threshold values identified in section 3.1.4 have been met, will be completed every year on a randomly selected 1% of the watershed's Rosgen B and C channel types. Monitoring will assess stream reaches of at least 40 times bank full width in length. These reaches will be randomly selected from the total stream channel in B and C types until at least 5% of these channels have been assessed after five years. Identical measurements will be made in appropriate reference streams where beneficial uses are supported. Data will be compiled after five years. The yearly increments of random testing that sum to 5% of the stream after five years should provide a database not biased by transit fish and macroinvertebrate population shifts. Based on this database the beneficial use support status will be determined.

3.1.12 Reasonable Assurance of TMDL Implementation

The federal government manages 93.9% of the land in the North Fork Coeur d'Alene River Subbasin. The state manages an additional 1.6%. The USFS (Region 1) and the BLM have signed a memorandum of agreement with DEQ to lead the development of TMDL implementation plans in subbasins where the USFS and/or BLM are the primary land managers. State agencies have been directed by a gubernatorial executive order to implement state developed TMDLs on lands that they manage. The memorandum and executive order should assure implementation plan development. The plan will be implemented based primarily on the budgetary constraints of the federal and state agencies. Bank erosion in the lower North Fork Subbasin is primarily on private land. It may be more difficult to assure that this source of sediment is addressed, because management and regulatory frameworks currently do not exist. However, compared to the magnitude of the sediment sources on lands managed by the federal and state government, this source is relatively small.

### 3.1.11 Feedback Provisions

Data from which the problem assessment and TMDL for the North Fork Coeur d'Alene Subbasin were developed are often crude measurements. As more exact measurements are developed during and after implementation plan development, these will be added to a revised TMDL as required.

When beneficial use (cold water biota and salmonid spawning) support meets the full attainment level, further sediment load reducing activities will not be required in the watershed. The interim sediment loading capacity will be replaced in a revised TMDL with the ambient sediment load. Best management practices for forest and agricultural practices will be prescribed by the revised TMDL with provisions to maintain erosion abatement structures. Regular monitoring of the beneficial use will be continued for an appropriate period to document maintenance of the full support of the beneficial use (cold water biota and salmonid spawning).

## 3.2 East Fork Eagle Creek Total Maximum Daily Load for Metals

### 3.2.1 Introduction

East Fork Eagle Creek exceeds Idaho water quality standards for cadmium, lead, and zinc. A TMDL is required to set metals discharge limits for point (mine adits) and nonpoint (waste piles and deposited sediments) pollutant sources in the stream's watershed.

### 3.2.2 Segments Addressed

The stream segment addressed by this TMDL is the East Fork Eagle Creek (HUC 17010301 5617) from its headwaters to Eagle Creek.

### 3.2.3 Point of Compliance

East Fork Eagle Creek is diluted below metals standards exceedances by West Fork Eagle Creek below the confluence of the two streams. Based on this pattern, the point of compliance was chosen as East Fork Eagle Creek at the Eagle Road Bridge.

### 3.2.4 Seasonality

To account for seasonal discharge by the streams, the 7Q10, 10th, 50th and 90th percentile discharges were established for the stream at the point of compliance (Table 33).

Table 33: Projected Discharges at the Point of Compliance for East Fork Eagle Creek

| Stream and Point of Compliance | 7Q10[1] (cfs)[2] | 10th percentile (cfs) | 50th percentile (cfs) | 90th percentile (cfs) |
|---|---|---|---|---|
| East Fork Eagle Creek at Eagle Road Bridge | 6.7 | 10.4 | 23.5 | 140.1 |

1. Seven day average low discharge over a ten year period; 2. cubic feet per second

### 3.2.5 Hardness Versus Discharge

A statistically significant relationship between water hardness (mg/L $CaCO_3$) and discharge was developed for the South Fork Coeur d'Alene River and most of its tributaries. East Fork Eagle Creek uniformly has low water hardness values. Water hardness is important because the Idaho cadmium, lead, and zinc standards are linked to the hardness of the receiving water. In the case of East Fork Eagle Creek, the default water hardness value of 25 mg/L $CaCO_3$, specified in the standards, was used.

### 3.2.6 Metals Loading Capacity

The Idaho water quality standards for dissolved cadmium, lead, and zinc at 25 mg/L$CaCO_3$ are provided in Table 34.

Table 34: Idaho Water Quality Standards for Dissolved Cadmium, Lead, and Zinc at 25 mg/L $CaCO_3$

| Hardness (mg/L $CaCO_3$)[1] | Cadmium (ug/L)[2] | Lead (ug/L) | Zinc (ug/L) |
|---|---|---|---|
| 25.0 | 0.37 | 0.54 | 32.3 |

1. milligrams per liter calcium carbonate; 2. Micrograms per liter

Based on these standards, the loading capacities for East Fork Eagle Creek are provided in Table 35. East Fork Eagle Creek does not exhibit hardness levels above 25 mg/L $CaCO_3$.

Table 35: Metals Loading Capacities of Cadmiun (Cd), Lead (Pb) and Zinc (Zn) for East Fork Eagle Creek at the Point of Compliance

| Point of Compliance | 7Q10[1] Cd (lb/d)[2] | 7Q10 Pb (lb/d) | 7Q10 Zn (lb/d) | 10th Percentile Cd (lb/d) | 10th Percentile Pb (lb/d) | 10th Percentile Zn (lb/d) | 50th Percentile Cd (lb/d) | 50th Percentile Pb (lb/d) | 50th Percentile Zn (lb/d) | 90th Percentile Cd (lb/d) | 90th Percentile Pb (lb/d) | 90th Percentile Zn (lb/d) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| East Fork Eagle Creek at Eagle Road Bridge | 0.013 | 0.019 | 1.17 | 0.021 | 0.030 | 1.81 | 0.047 | 0.068 | 4.09 | 0.279 | 0.408 | 24.39 |

1. seven day average low discharge over a ten year period; 2. pounds per day

### 3.2.7 Margin of Safety

The precision of measurement of metals in the water samples collected is plus or minus 5%, while the discharge measurements contain another error of plus or minus 5%. Therefore, the metals load measurements have an error of plus or minus 10%. A margin of safety of 10% was applied to conservatively account for these errors. The margin of safety is subtracted from the metals load capacities (Table 35) to develop the allocatable metals loads (Table 36).

Table 36: Metals Loads that can be Allocated to Sources in East Fork Eagle Creeks

| Point of Compliance | 7Q10[1] Cd (lb/d)[2] | 7Q10 Pb (lb/d) | 7Q10 Zn (lb/d) | 10th Percentile Cd (lb/d) | 10th Percentile Pb (lb/d) | 10th Percentile Zn (lb/d) | 50th Percentile Cd (lb/d) | 50th Percentile Pb (lb/d) | 50th Percentile Zn (lb/d) | 90th Percentile Cd (lb/d) | 90th Percentile Pb (lb/d) | 90th Percentile Zn (lb/d) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| East Fork Eagle at Eagle Road Bridge | 0.012 | 0.017 | 1.05 | 0.019 | 0.027 | 1.63 | 0.042 | 0.061 | 3.68 | 0.251 | 0.367 | 21.95 |

1. seven day average low discharge over a ten year period; 2. pounds per day

### 3.2.8 Allocations to Point and Nonpoint Sources

The metals loads from the point discharges were established for the watershed. East Fork Eagle Creek has only one point source, the Jack Waite adit. The in-stream metals loads were established for the stream by monitoring. The metals load data were partitioned based on the discharge tiers . The percentage of the loads attributable to the point sources was developed for each level of discharge (Table 37). The nonpoint sources account for the remaining loads.

Table 37: Contribution of Point Discharges to Metals Loads of East Fork Eagle Creek

| Discharge Tiers | 7Q10-10th | 10th - 50th | 50th - 90th | 90th+ |
|---|---|---|---|---|
| Cadmium | 13.8% | 4.6% | 28.2% | 5.1% |
| Lead | 7.5% | 1.5% | 9.0% | 1.8% |
| Zinc | 18.1% | 5.9% | 89% | 23% |

## 3.2.9 East Fork Eagle Creek

### 3.2.9.1 Waste Load Allocation

A single point discharge of metals was identified in the East Fork Eagle Creek Jack Waite Adit. The waste load allocated to the adit is provided in Table 38.

Table 38: Waste Load Allocated to the Jack Waite Adit in East Fork Eagle Creek

| Discharge Tiers | 7Q10-10th | 10th - 50th | 50th - 90th | 90th+ |
|---|---|---|---|---|
| Cadmium (pounds/day) | 1.7E-03[1] | 9.0E-04 | 1.2E-02 | 1.3E-02 |
| Lead (pounds/day) | 1.2E-03 | 4.0E-04 | 5.5E-03 | 6.5E-03 |
| Zinc (pounds/day) | 1.9E-01 | 9.7E-02 | 3.28 | 5.05 |

1. E is the Log base 10

### 3.2.9.2 Load Allocation

The nonpoint discharge sources to East Fork Eagle Creek are the Jack Waite mine waste piles including contaminated material eroded into Tributary Creek and deposited contaminated material further downstream along East Fork Eagle Creek. It is estimated the Jack Waite piles and the materials in Tributary Creek represents 80% of the nonpoint load, while the East Fork Eagle Creek deposits contribute 20%. Based on these estimates, the load allocation for East Fork Eagle Creek was developed by partitioning the remaining load not allocated to the point source between these two sources at the estimated percentages. Allocations are made at each discharge tier (Table 39).

Table 39: Load Allocations to the Nonpoint Sources of Metals in East Fork Eagle Creek

| | Discharge Tiers | 7Q10-10th | 10th - 50th | 50th - 90th | 90th+ |
|---|---|---|---|---|---|
| Cadmium (pounds/day) | Jack Waite Mill and Tributary Creek (80%) | 8.3E-03[1] | 1.45E-02 | 2.4E-02 | 1.9E-01 |
| | Stream Sediment (20%) | 2.1E-03 | 4.0E-03 | 6.0E-03 | 4.8E-02 |
| Lead (pounds/day) | Jack Waite Mill and Tributary Creek (80%) | 1.26E-02 | 2.13E-02 | 4.4E-02 | 2.88E-01 |
| | Stream Sediment (20%) | 3.2E-03 | 5.3E-03 | 1.1E-02 | 7.2E-02 |
| Zinc (pounds/day) | Jack Waite Mill and Tributary Creek (80%) | 6.88E-01 | 1.23 | 3.2E-01 | 13.52 |
| | Stream Sediment (20%) | 1.72E-01 | 3.07E-01 | 8.0E-02 | 3.38 |

1. E is the Log base 10

### 3.2.10 Reasonable Assurance of TMDL Implementation

The metals contamination of the Coeur d'Alene Basin has been a primary concern to both the EPA and DEQ. The metals sources of the North Fork Coeur d'Alene River tributaries have been assessed in a remedial investigation and feasibility study conducted by the EPA. The state has included the North Fork metals sources in its implementation plan. Both point and nonpoint sources will be addressed initially through Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) mechanisms. Point sources will be addressed with remedial studies, and, where necessary, with consent decrees between EPA and the responsible parties. After the consent decree remedy had defined the practical level of treatment and that treatment was installed, the EPA will issue National Pollutant Discharge Elimination System (NPDES) permits for these sources. Nonpoint sources will be addressed through removal actions sponsored by the state, EPA, or federal land management agencies (mainly BLM and USFS).

### 3.2.11 Feedback Provisions

Data from which the problem assessment and TMDL for the North Fork Coeur d'Alene sub-basin were developed are few in number. As more exact measurements are developed during implementation plan development, these will be added to a revised TMDL as required.

When metals standards meet the full attainment level, further metals load reducing activities will not be required in the watershed. Regular monitoring of the beneficial use will be continued for an appropriate period to document maintenance of the full support of the beneficial use (cold water biota and salmonid spawning).

# 4. Response to Public Comment

The Subbasin Assessment and Total Maximum Daily Loads of the North Fork Coeur d'Alene River (17010301) was made available to the public for review and comment on November 20, 2000. Copies of the documents were placed in public document repositories at the DEQ Coeur d'Alene Regional Office, the Coeur d'Alene Public Library, and the Kellogg Public Library. The documents were available at DEQ's web site at www2.state.id.us/deq. The comment period was initially for 30 days to December 21, 2000. The Shoshone Natural Resource Coalition requested an extension of the comment period for an additional 30 days. The extension was granted. The comment period ended January 22, 2001.

Fourteen letters of comment were received. These letters contained 172 distinct comments. Some of these comments were identical or very similar, while others were unique. Where comments were identical or similar, a single response is provided in the responses below.

The responses to these comments are organized into four sections: general comments, comments concerning metals, comments concerning sediment, and miscellaneous comments. Letters of response were developed for each letter received. The comment letters and the responses to those letters are available in Appendix E.

## 4.1 General Comments

Comment 1: The TMDLs fail to comply with applicable federal and state laws & regulations.

Response 1: DEQ believes the TMDL meets the requirements of state and federal law. The TMDL contains all those elements required by Idaho Code section 39-3611, CWA section 303d and 40 CFR 130.7. A similar metals TMDL was approved by the EPA for the South Fork Coeur d'Alene River and similar sediment TMDLs, using the same model as was used for the North Fork TMDL, were approved for Wolf Lodge, Cougar, Kidd, Mica, and Latour Creeks.

Comment 2: Neither of the proposed TMDLs are required under CWA section 303(d)(1) because TMDLs are only required for waters impaired by point sources operating under technology based effluent limitations. The proposed TMDLs, if necessary at all are clearly intended to be TMDLs under CWA section 303(d)(3).

Response 2: DEQ disagrees that TMDLs are only required for waters impaired by point sources. TMDLs are a part of the water quality-based approach under section 303 of the CWA that is clearly not limited to point sources. For additional clarification see Pronsolino v. Browner, (2000) and Response to Comments regarding the TMDL for dissolved cadmium, lead and zinc in the Coeur d'Alene River Basin at pages 57 to 60 (EPA-DEQ 2000). In addition, Idaho law clearly requires TMDLs to address both point and nonpoint sources of pollution as can be seen in Idaho Code sections 39-3602(27) (defines TMDL to include load allocations for nonpoint sources) and 39-3611(directs development of TMDLs to control point and nonpoint sources of pollution). The water quality limited segments of the North Fork Coeur d'Alene River are listed on both the 1996 and 1998 Idaho 303(d) water quality limited segments list. The subbasin assessment for the North Fork confirmed that the waters at issue do not meet state water quality standards. Therefore, TMDLs are required under CWA section 303(d).

Comment 3: Point source "impacts" have not been shown to be a "problem" in either TMDL and since 303d is limited to point sources, no TMDL is required.

Response 3: DEQ disagrees that 303(d) only requires TMDLs for point sources. See response to the comment 2 above. Moreover, the subbasin assessment (SBA) clearly indicates that adit discharges (discrete point sources) are well above 25% of the metals loads under the lowest discharge conditions. Some of these percentages approach 50% (see page 20). These data demonstrate that the adit discharges are a significant part of the metals standards exceedance.

Comment 4: Both DEQ and EPA have failed to comply with the CWA mandate of Section 304(a)(2)(D).

Response 4: DEQ is not mandated to take any action pursuant to 304(a)(2)(D). EPA, however, did publish information (December 28, 1978, Federal Register) that all pollutants are suitable for maximum daily load measurement and correlation with the achievement of water quality objectives.

Comment 5: DEQ cannot ignore the APA [Administrative Procedures Act] process.

Response 5: TMDLs are plans for the restoration of water bodies to the level of the water quality standards. Idaho Code section 39-3602 states, "Total maximum daily load (TMDL) means a plan for a water body not fully supporting designated beneficial uses…." TMDLs do not have the force and effect of law and are not required to follow the Idaho Administrative Procedures Act rule-making process.

Idaho Code section 39-3611 addresses the development of TMDLs and requires TMDLs be developed in accordance with those sections of law that provide for involvement of Basin Advisory Groups and Watershed Advisory Groups, and as required by the federal CWA. There is no requirement in this section that the TMDL be developed as a rule.

Idaho Code section 39-3612, on the other hand, addresses the integration of TMDLs, once completed, with other water quality related programs and provides that this integration is subject to the provisions of the Idaho Administrative Procedures Act. Thus, to the extent required by the Idaho Administrative Procedures Act, DEQ and other designated agencies must follow the Idaho Administrative Procedures Act provisions when TMDLs are implemented and enforced under applicable state programs.

Given the scope of the TMDL program and requirements of the court-approved schedule for development of TMDLs, it is clear the Idaho Administrative Procedures Act rulemaking provisions are not applicable. The schedule for development of TMDLs in Idaho is the product of federal court litigation. According to the TMDL schedule, from 1997 to 1999, DEQ was to develop 529 TMDLs. Under the Idaho Administrative Procedures Act, rules must be approved by the legislature before they become effective. Because of this and other rulemaking requirements, rules typically take almost a year to promulgate. Idaho Code section 39-3601 et seq. was enacted in response to this federal TMDL litigation and the legislature certainly never intended DEQ to attempt to promulgate hundreds of required TMDLs as rules.

The federal administrative procedures does not require EPA adopt TMDLs as rules. Moreover, given the short deadlines in section 303d of the CWA, including the requirement that TMDLs be developed within 30 days of EPA disapproval of a state TMDL, the CWA clearly does not envision or require TMDLs be developed as rules.

Comment 6: TMDLs are incomplete, thus do not constitute a TMDL as required by regulation; not all point and nonpoint sources identified.

Response 6: To our knowledge all point sources of metals have been identified. The nonpoint sources have been identified to the state of the knowledge in these watersheds for both metals and sediment.

Comment 7: DEQ internal guidance documents not followed.

Response 7: The comment does not identify which internal DEQ guidance document(s) were not followed. In the opinion of the technical staff and internal reviewers, internal DEQ guidance was followed.

Comment 8: Fish surveys from seven years ago should not be used to make today's determinations, Table 14; page 25.

Response 8: DEQ is required to use the most current data when developing an SBA, and lack of information is not an excuse to delay TMDL development. These surveys are the most current data on many streams of the North Fork. The IDFG advises DEQ that they are most reflective of the fish populations of the North Fork Coeur d'Alene River watershed.

Comment 9: The SBA stated that unlisted water bodies contribute to listed water bodies and actions must be taken on the unlisted water bodies, page 54. The opinion is expressed that no legal authority exists to do this.

Response 9: Under both federal and state law, TMDLs must address all sources of a pollutant to a listed water body. Idaho Code section 39-3611 specifically directs DEQ to identify all sources within the watershed that are contributing pollutants to the listed water body. In addition, CWA section 303(d) requires that TMDLs be established at levels necessary to implement applicable water quality standards. Absent controls on upstream sources, DEQ would lack the assurance that the TMDL for downstream waters would result in the attainment of water quality standards. In the case of the North Fork Coeur d'Alene River, the segment from Yellowdog Creek to the mouth of the river is listed for sediment. Sediment sources exist throughout the watershed above this segment as well as in this segment. This situation and the evidence that sediment is a pollutant natural to all watersheds require that the North Fork Coeur d'Alene River TMDL address all watercourses of the watershed. The argument that a TMDL for sediment of all stream courses was further clarified on the pages 50 and 54.

Comment 10: Anti-degradation rules are misapplied.

Response 10: Anti-degradation does not apply to impaired waters. It applies only to waters that are below the standards thresholds. The TMDL does not mention anti-degradation nor does it misapply it. For further explanation the commenter is referred to section 3., page 54.

Comment11: The state is engaged in illegal rulemaking without following the proper procedures. The TMDL and subsidiary discharge limits are of no legal force or effect and cannot be applied to Beaver Creek or the North Fork Coeur d'Alene River Subbasin.

Response 11: TMDLs are plans for the restoration of water bodies to the level of water quality standards. Since they are plans, they do not have regulatory authority and are not required to follow the Idaho Administrative Procedures Act process. TMDLs are implemented at the state and federal level through regulatory programs. State regulatory programs and their component regulations must follow the proper rulemaking procedures prior to promulgation.

Comment 12: The SNRC [Shoshone Natural Resource Coalition] requests full disclosure of roads to be removed and public input in the process to include a 30-day comment period.

Response12: The sediment TMDL is a plan to recover the water quality of the North Fork Coeur d'Alene River. An implementation plan will be developed after the TMDL is approved. This implementation plan will contain details on actions to be taken, some of which could be road closures or, more likely, road replacements. In any case, the implementing agency, the USFS, would be required by federal law to give notice of any closure and provide for public input.

Comment 13: Some streams listed in the SBA are not listed on the most recent 303(d) list. These streams should be removed from the SBA.

Response 13: Section 2 lists those streams on the 1998 303(d) list and those that were on the 1996 list, but removed from the 1998 list. In the case of sediment, the entire watershed yields sediment to the most downstream sediment listed segment, the North Fork Coeur d'Alene River between Yellowdog Creek and the mouth. Since this is the case, the TMDL for this segment must address sediment from the entire North Fork watershed. This point is made clearly in the section 2; page 50.

Comment 14: KEA [Kootenai Environmental Alliance] did not agree with the waterbodies delisted from the 1996 list to create the 1998 list.

Response 14: EPA approved the 1998 list 303(d) list with some adjustments. Those EPA adjustments addressed temperature delistings and do not affect the North Fork Coeur d'Alene watershed.

Comment 15: The data indicates that the North Fork Coeur d'Alene River is fully supporting beneficial uses in accordance with WBAG [Water Body Assessment Guidance]. The data clearly indicates salmonid spawning is fully supported. No data indicates that sediment is impairing the beneficial uses.

Response 15: The WBAG determination is no longer DEQ policy. Prior to the adoption of WBAG, as revised, TMDL staff were instructed to use the WBAG determinations and for any segment taken off the 1998 list all other pertinent data. We respectfully disagree that no other data indicate that sediment is impairing the cold water biota and salmonid spawning. It is not reasonable to expect that a correlation can be developed between sediment impact surrogates such as residual pool volume and fish density. Such a correlation would presuppose that the electrofishing was completed at that exact time when that environmental factor was limiting. This is better stated by John M. Barthalow, who wrote, "If you think about it, fish populations are rarely directly related to the amount of habitat present at the time of measurement. The standing crop (biomass) and usable habitat values can be expected to be correlated only when measured at the time that the habitat is limiting and for the life stage that is habitat limited. Simultaneous measurement, however, is not sufficient. For a limitation to be operative, the population must be at 'carrying capacity', that is not reduced or altered in number by some non-habitat factor such as fishing pressure, a pollution-caused fish kill, stocking, etc." (Barthalow 2000, p. 15) DEQ believes it can use a weight of evidence approach to demonstrate sediment impact. RASI, residual pool, and model results all indicate sediment impacts.

Comment 16: Draft assessment does not adequately address metals.

Response 16: The comment was made on an earlier SBA draft. Metals issues are covered in section 2.3.2.2.1.

Comment 17: Segments de-listed from the 1996 list in the 1998 list must be re-assessed with an improved WBAG process when this has been developed.

Response 17: When WBAG2 is approved, streams could be re-evaluated. DEQ State Office personnel decide what data sets are used to re-evaluate streams and which streams are re-evaluated. These decisions will not likely affect the metals impaired streams since the exceedance of metals standards is clear-cut. They will also not affect the sediment TMDL since by necessity it must be written for the entire watershed to address the lowest segment of the watershed that is impaired, the North Fork Coeur d'Alene River from Yellowdog Creek to its mouth.

Comment 18: The 16 segments dropped from the 1998 303(d) list need to have the BURP data since 1993 reassessed with the improved WBAG (new) system.

Response 18: See the response to comment 17 above. When WBAG2 is approved, streams could be re-evaluated. DEQ State Office personnel decide what data sets are used to re-evaluate streams. In the case of the segments de-listed in the North Fork Coeur d'Alene River, this is a moot point. They are all listed for sediment. The sediment TMDL addresses all of these segments.

Comment 19: The TMDL should identify Shoshone Creek as water quality limited for unknown pollutants. What is the pollutant?

Response 19: The SBA did not show any evidence of an unknown pollutant in Shoshone Creek. Any pollution that exists is most likely from sediment. The stream is included in the sediment TMDL

Comment 20: Need to include data for Prichard and EF Eagle Creek on dissolved oxygen, bacteria, nutrients and oil and grease and pH.

Response 20: The SBA has been revised with this data now included.

Comment 21: Identify data gaps, if none so state.

Response 21: Data gaps are identified in section 2.3.2.5.3.

Comment 22: The SBA addresses only sediments with respect to loads. It needs to address metals and other pollutants.

Response 22: This comment is in response to an earlier draft of the SBA. The SBA addresses metals loads (section 2.3.2.2.1), and metals TMDL allocations are provided for the streams impaired by metals (section 3.2).

Comment 24: Section 3, Sediment and metals TMDLs, this section should be incorporated into the main body of the document.

Response 24: The format used in the package, (Section 1.0 Executive Summary, Section 2.0 SBA, Section 3.0 TMDL Allocations, Section 4.0 Responsiveness Summary, and Section 5.0 References) is the format required by DEQ. Section 5 will be completed on end a half years after the subbasin assessment and TMDL allocations are approved.

Comment 25: The word interim should be struck from the TMDL. TMDL actions are final actions.

Response 25: We disagree. Any TMDL is subject to revision as standards change or new information is developed. In the usage of "interim" in the text, it is clear that the proper level of sediment yield is to be established. This new information will be used to develop a refined TMDL. In this sense, any TMDL is interim. In addition, EPA uses the term “interim” in its own guidance.

### 4.2 Metals Assessment and TMDL Comments

Comment 26: [The] [d]raft TMDL circumvents [the] APA process by adding a pollutant and a segment for that pollutant.

Response 26: The TMDL is not a rule. The commenter is probably referring to the fact that monitoring in Beaver Creek showed it exceeds cadmium, lead, and zinc standards. However, Beaver Creek is currently listed for sediment. The policy of DEQ and the EPA is to address all pollutants of concern for 303(d) listed water bodies. The metals were found to be pollutants of concern because the levels violate state water quality standards. DEQ will go through the required process, including public notice and participation, to list this water body. Prior to listing, the TMDL that has been developed and was included in the comment package is not required to be submitted to or reviewed by EPA.

A public comment period of 60 days was provided for the current SBA and TMDL. It is clear from the data that metals standards are exceeded. Public comment concerning metals in Beaver Creek has been taken and is being responded to at this time. Since the data is clear, DEQ has chosen to be thorough and prepare a TMDL for cadmium, lead, and zinc for Beaver Creek. DEQ will defer the Beaver Creek metals TMDL until the stream is listed for cadmium, lead, and zinc.

Comment 27: DEQ failed to fully consider the effect of natural background.

Response 27: The issue of natural mineralization was addressed in the Coeur d'Alene Basin metals TMDL and in the Natural Resource Damage Assessment process. Technical analyses of 40 sites in the mineralized zone of the Silver Valley demonstrate that metals background in water is somewhat higher than non-mineralized zones, but well below the metals standards. A further discussion of this point can be found on page 35 of the *Coeur d'Alene Basin Metals TMDL* (EPA-DEQ, 2000) response to comments and in its technical support document. DEQ assumes that this data is applicable to the mineralized zone of the North Fork Coeur d'Alene watershed. A further discussion of natural background metals concentrations has been placed in the SBA (section 2.3.2.2.1.5; page 19).

Comment 28: The proposed "margin of safety" is highly inappropriate.

Response 28: The rationale for the margins of safety are incorporated in the TMDLs. For metals, the margin of safety is based on the precision of stream discharge measurements and the analytical precision of metals measurements. The sediment TMDL incorporates the margin of safety into the conservative goal of 50% above background sediment yields. Below this level of sediment yield, the referenced studies indicate that water quality impairment is not observed.

Comment 29: The 90th percentile hardness is 20; it should be 25, page 69.

Response 29: The 90th percentile of the hardness data set for Beaver Creek is 20 mg/L $CaCO_3$. The metals standards, as applied in the TMDL, are cut off at a hardness of 25 with no application of a standard below this level.

Comment 30: Is table 7 (page 15) the TMDL for the stream at these flow tiers?

Response 30: Table 7 provided in-stream measurement of the metal loads in the four flow tiers for Beaver and East Fork Eagle. It is not the loading capacity; it is the current measured metals loads. Table 7 is Table 8 (page 19) in the current document.

Comment 31: Seasonal variability is not addressed by the TMDL (of reviewed document). (Page 15; table 7).

Response 31: Table 7 divides the metals loads measured in-stream into the various flow tiers based on the discharge when the measurement was taken. Table 7 specifically addresses seasonal variability. Table 7 is not, however, the TMDL (see comment response 30). Table 7 is Table 8 (page 19) (page 19) in the current document.

Comment 32: At these tiers are the criteria exceeded at each tier? (Page 15, Table 7)

Response 32: At these tiers the metals standards are exceeded in every case. Table 7 is Table 8 in the current document.

Comment 33: No actual data for the adits addressed in the TMDL; there is time to collect this data before 2003, page 15.

Response 33: The concentration data for the adit discharges is actual data from the EPA remedial investigation database. The discharges come from this database as well. They are weighted for annual discharge based on a synthetic hydrograph developed from the Gem adit discharge record. The database source should have been cited in the text. The adit discharge database source is now cited in the SBA text (section 2.3.2.2.1.5, page 19).

Comment 34: It is not clear how the weighted discharge is calculated, page 16, Table 8.

Response 34: The procedure was not sufficiently outlined in Appendix A. This change was made to Appendix A and referenced on page 19 of the SBA (section 2.3.2.2.1.5).

Comment 35: Are non-discrete discharges all monitored; there is time to monitor these discharges, page 17 section 2.3.2.2.1.6.

Response 35: The non-discrete (nonpoint) sources are based on the best professional judgement of USFS, USGS, and DEQ staff. Monitoring these sources would constitute a time consuming and expensive undertaking that could not be completed prior to the 2003 deadline.

Comment 36: Absence of sculpins indicates the presence of heavy metals. How are other factors ruled out?

Response 36: It is a common observation in the Natural Resource Damage Assessment documents, BURP data, and site-specific criteria preparatory inventories that sculpin are not found downstream of metals sources. They are found in streams where all other factors are present except metals. The interaction is likely not a water column quality factor because the site-specific studies have found sculpin relatively resistant to metals in the water column. The SBA text (section 2.3.2.4; page 23) was augmented to cover the points stated above.

Comment 37: The data is inadequate in respect to seasonality. Water quality, flow discharge and therefore calculated metals loadings are inaccurate. Example: EPA required ten (10) years of data for Coeur's Kensington Project in Alaska.

Response 37: The TMDL goals are based on 7Q10, 10th, $50^{th}$, and 90th percentile flows. These discharges are well established from nearby watersheds, and the SBA clarifies the method by which these discharges were developed. These flows account for the seasonality of the TMDL goals. The stream discharge data developed by DEQ provides seasonality that mirrors the calculated values. These same data included metals loads measured in-stream. The mine adit data is limited but is from the same database used to develop the *Coeur d'Alene Basin Metals TMDL* (EPA-DEQ, 2000). The Gem adit discharge data is the most extensive mine adit discharge record available. The rule of TMDL development is to use the best available data. The best available data was used to develop the North Fork metals TMDLs.

Comment 38: Data should reflect local conditions; designated uses should be determined attainable.

Response 38: The entire data set used to develop the SBA and TMDLs is a local database, which reflects local conditions. For example, data from the Silverton gauge station was used to develop the discharge seasonality. The Silverton station is located in the same mountain range, with the same general vegetation and the same climate. It reflects local conditions.

The designated uses for metals impaired streams are cold water biota and primary or secondary contact recreation as defined by the Idaho Water Quality Standards and Wastewater Treatment Requirements (IDAPA 58.01.02.101.01.a.) The SBA states these designations (section 2.2.2; page 11).

Comment 39: Gem adit discharge data limited to one-year.

Response 39: The Gem adit data is limited to a single year, but it is the best available data for adit discharge.

Comment 40: Data missing for August and September 2000 in Beaver and EF Eagle Creeks and January 2000 in Prichard Creek.

Response 40: The August and September 2000 data will be added to the record. These results were not available when the draft SBA and TMDLs were developed, but are now available. January 2000 Prichard Creek data was not collected by the USGS. This is a data gap that cannot be filled. DEQ continues to monitor Prichard Creek at Murray and will include these data as they become available.

Comment 41: Assessment assumes all dissolved metals from adits are point sources that are all delivered to the adjacent stream without attenuation.

Response 41: The North Fork metals TMDLs use the same conservative assumption that all metals are delivered to the stream as the *Coeur d'Alene Basin Metals* TMDL (EPA-DEQ, 2000). The assumption ignores attenuation of metals. As these adit discharges are addressed in the implementation of the TMDL plan the opportunity will be afforded to demonstrate and be credited with attenuation.

Comment 42: Attenuation in-stream is not accounted for in the TMDL. Loading capacities at higher flow do not reflect the higher attenuation only the higher flow.

Response 42: In-stream attenuation is accounted for in this TMDL. The load reductions required at each flow tier is the difference between the calculated TMDL goals based on the discharges and the metals standards and the metals loads measured in-stream by DEQ. The in-stream measurements themselves account for any metals that are attenuated by the stream.

Comment 43: Commenter supplies comments made by ASARCO (Appendix E) and notes these comments apply equally to Beaver Creek.

Response 43: Several of the comments and the responses to those comments are applicable to the Beaver Creek metals TMDL. The response to ASARCO's letter of comment was sent to the commenter (Appendix E).

Comment 44: DEQ should defer the metals TMDL until completion of the CERCLA initiated removal actions.

Response 44: The TMDL process is related to, but independent of, the CERCLA process. The TMDL process develops water quality applicable or relevant and appropriate regulatory requirements (ARARs) for the site by translating the water quality standards into daily permissible loads dependent on the season. The situation in the East Fork Eagle Creek is straightforward. The Jack Waite adit is the only point pollution source, while the Jack Waite mill complex, tailings ponds, and tailings washed downstream are the nonpoint sources. Since the TMDL provides a plan to respond to meet water quality standards, it is appropriate that the East Fork Eagle Creek TMDL precedes any CERCLA consent decrees.

Comment 45: If DEQ does not defer the TMDL then it should specifically phase the metals TMDL. Concern is stated that EPA will override the phasing of the TMDL implementation.

Response 45: The term "phasing" is not defined in this comment; however, EPA does not accept the phasing of TMDLs. This stated, TMDLs can be renewed and incorporate new data at any time. Should there be a shift in metals standards for the water body, or important new data becomes available, a new TMDL would be required to reflect this new data. This would be renewing the TMDL.

Comment 46: DEQ should defer or phase the metals TMDL to allow development and use of site-specific water quality criteria.

Response 46: Site-specific criteria for lead and zinc have been developed for the reach of the South Fork Coeur d'Alene River above Wallace. Work has been completed to extend these results to the metals contaminated segments of the South Fork Watershed below Wallace. A justification of this is in preparation. No plans have been developed to do the studies necessary to extend these results to the Beaver and Prichard Creek watersheds. Such work, if undertaken, may extend well past 2003 the due date of these TMDLs. When and if the site-specific standards were extended to the Beaver and Prichard Creek watersheds, the current TMDL and those developed for Prichard and Beaver Creeks would be revised to reflect the current (new) metals standards.

Comment 47: Idaho code section 39:3611 limits controls on point discharges.

Response 47: The limits on point source controls in 39-3611 are not applicable to this TMDL under either state or federal law because Idaho Code section 39-3611 limits controls on point source discharges when these are less than 25% of the metals loads. Section 2.3.2.2.1.5 (table 10; page 20 of the SBA (page 19) clearly demonstrates that the single point discharge at the Jack Waite adit comprises 50% of the cadmium load under 7Q10 discharge conditions. In addition, Idaho Code 39-3611 applies to water bodies where the applicable water quality standard has not been met due to impacts that occurred prior to 1972. While there were significant impacts to the North Fork Coeur d'Alene River that occurred prior to 1972, there are also continuing and post-1972 discharges that have contributed and continue to contribute to the non-attainment of state water quality standards. Moreover, under both state and federal law, the TMDL must meet requirements of the CWA (See Idaho Code sections 39-3601 ["It is the intent of the legislature that the state of Idaho fully meet the goals and requirements of the federal clean water act.."] and 39-3611 ["For water bodies described in section 39-3609, Idaho Code, the director shall…as required by the federal clean water act, develop a total maximum daily load…"]. A TMDL that does not call for point source reductions would not meet the requirements of the CWA because the TMDL could not assure compliance with state water quality standards.

Comment 48: There should be greater emphasis that this is a phased TMDL.

Response: The TMDL is not phased and would not be approved by EPA as a phased TMDL. However, any TMDL is open to revision based on new information (see response to comment 45).

Comment 49: The calculation of discrete discharges of metals is indecipherable and erroneous.

Response 49: The calculation was difficult to follow. This has been remedied in the text of the revised document (section 2.3.2.2.1.5, page 19) and in Appendix A. DEQ respectfully disagrees that it is erroneous. The calculation of the adit discharge of metals was made more understandable in the text and Appendix A.

Comment 50: The waste load allocations should not decrease as creek flows increase. Hardness data provided.

Response 50: The waste load allocations decrease because the percentage of the load that is attributable to point discharges decreases as the discharge increases. This is a major difference between the *Coeur d'Alene Basin Metals TMDL* (EPA-DEQ, 2000) and these North Fork metals TMDLs. The Coeur d'Alene Basin TMDL gave the discrete sources a 25% allocation based on the mixing rule in the Idaho Water Quality Standards and Wastewater Treatment Requirements (IDAPA 58.01.02.06.01.e.iv.). The North Fork TMDL calculates the discrete load based on adit discharges and synthetic hydrographs based on the Gem adit discharge. The percentage point load was calculated by dividing the point load by the measured load at each flow tier.

The hardness data provided clearly indicate that the adit adds hardness to the stream. This hardness effect is diluted even in Tributary Creek and likely is very small at the point of compliance near the mouth of the East Fork Eagle Creek. The metals are detected at the point of compliance in the loads measured and at hardness levels all below 25mg/L $CaCO_3$. Thus the hardness data is not applicable to the point of compliance.

Comment 51: Lead should be deleted from the TMDL for the East Fork Eagle Creek. Use of one-half detection for non-detection increases a load that is trivial.

Response 51: The standard method data interpretation considers non-detection as the value one half of detection. However, we agree this approach may create a lead load where arguably none exits. The database was searched for detections of lead above the state standards. Exceedances occurred in eleven of thirteen samples. Use of one-half detection in the two remaining samples is warranted.

Comment 52: Dissolved to total recoverable metals ratios should be incorporated into the metals TMDL.

Response 52: Idaho's standards state the cadmium, lead, and zinc standards in terms of dissolved cadmium, lead, and zinc. Dissolved to total recoverable metals ratios are important translators for point discharges since their permits are based on total recoverable levels. The database is not sufficient to develop such translators where they are appropriate at the adit discharge. These translators will be developed as the adit discharge is better characterized in the CERCLA consent decree and NPDES programs that will implement the TMDL.

Comment 53: Within Tributary Creek the hardness from adit and seep flows adds to the loading capacity.

Response 53: The hardness from the adit and seeps discharged to Tributary Creek is not detectable at the point of compliance, while the metals are. The hardness must be diluted from the stream system (see response to comment 50).

Comment 54: The TMDL's assessment of point sources is inadequate.

Response 54: The assessment of the adit discharges is based on the database developed for the EPA remedial investigation. The database was developed originally by the Idaho Geologic Survey (University of Idaho) for the USFS. At the time it was the best available data. Additional data on the discharge and metals characterization of the Jack Waite adit was supplied to DEQ by ASARCO's consultants. It has been incorporated into the SBA and East Fork Eagle Creek metals TMDL.

Comment 55: Biological monitoring can be used to establish ecological goals for the basin.

Response 55: Biological goals are appropriate for pollutants such as sediment. In these cases, narrative standards govern the amount of sediment and these standards are tied directly to the full support of beneficial uses. Metals are governed by numeric standards that assume full support of the beneficial use. In the case of metals, the numeric standards must be attained.

Comment 56: Site-specific metals criteria will result in a technically superior TMDL.

Response 56: This may or may not be true. However, at this time and for the foreseeable future (next two years), the current state metals standards are expected to be the governing standards.

Comment 57: By using the EPA developed metals criteria, DEQ already has a sufficient margin of safety.

Response 57: Although conservative, the metals standards are not deemed by DEQ or EPA to eligible as a component of a TMDL's margin of safety.

Comment 58: The flow tier approach provides a margin of safety not acknowledged in the TMDL.

Response 58: The flow tier approach accounts for the seasonal stream discharge and is not a margin of safety factor.

Comment 59: DEQ should not impose metals TMDLs without knowing whether the source reductions will be technically or economically feasible.

Response 59: TMDLs are required by federal law and, in Idaho's case, a court order. These planning documents must be developed and issued by DEQ and EPA to meet the agencies' legal responsibilities. Should the source reductions not be technically or economically feasible, such that the TMDL cannot be met, the CWA contains mechanisms such as use attainability and standards changes to address such situations.

Comment 60: Need to provide information on the relationship between metals and sediments.

Response 60: The SBA indicates the only relationship between metals and sediment. Lead is particulate bound. There is no other relationship between metals (zinc and cadmium in the dissolved fraction and lead on fine particulate) and the sediment (cobble) filling pools in the North Fork. Sediment from mining sources is a very small component, even in the Prichard and Beaver Creek watersheds, when compared to sediment from other sources. On a North Fork-wide basis there is no comparison.

Comment 61: Need to discuss potential and variability of these sources with respect to metals and other pollutants.

Response 61: Variability of sediment discharge to the streams is discussed (see section 2.3.2.5.2; page 36-44) and its episodic nature noted. The variability of metals loads is addressed in the SBA and TMDLs by addressing flow tiers (seasonal discharge)(see section 2.3.2.2.1.4; page 19 and section 3.2.4; page 68).

Comment 62: Need additional information about pH and metals on East Fork Eagle Creek and metals data from the Jack Waite complex. Do Jack Waite or other mines have permitted discharges?

Response 62: The comment was made to an earlier draft of the TMDL. These data are provided in the current SBA (see section 2.3.2.2.1.1; page 16). The Jack Waite adit discharge and the discharge of all adits in Beaver, Prichard, and East Fork Eagle Creeks are not permitted under the National Point Discharge Elimination System program.

Comment 63: The SBA was missing discussion on pollution control efforts to control metals.

Response 63: This material was missing. Metals pollution control is taking shape in the Beaver and Prichard Creek watersheds. This information was added to the pollution control strategy section of the SBA (see section 2.4.2; page 52).

Comment 54: The SBA needs to provide the time frame for activities to achieve water quality standards for metals.

Response: A time line to address metals is provided in the pollution control strategy (see section 2.4.2; page 52).

**4.3 Sediment Assessment and TMDL Comments**

Comment 55: It is clear cutting that has affected the river causing bank erosion from the peak flows.

Response 55: The flood frequency of the North Fork is analyzed on page 14 (section 2.3.2.1.1). The analysis examines the peak discharge events over the past 62 years. It finds that the 1974 and 1996 high discharge events are the largest of record, and the 1933 event is likely the largest flood of historic times based on photographic evidence and data from the Post Falls and Cataldo gauges. The history of logging shows that clear cuts began in the 1940s and 1950s, intensified through the 1960s and 1970s, and decelerated into the 1980s. The flood history does not support the argument that clear cutting has caused greater flood discharges.

The riverbed is filled with cobble materials delivered by erosion. The presence of cobble bed load material has caused discharges of lesser magnitude to result in more over-bank flooding, causing the impression that higher discharges have occurred with the proliferation of clear cutting.

The SBA was strengthened on page 14 to better describe the flooding affect.

Comment 56: Clearing of vegetation in the river valley and alterations to the banks (sand beach) is causing sedimentation.

Response 56: Clearing and harvesting riparian vegetation along the river has depleted the amount of LOD (tree trunks and stumps) in the river. In recent years, it has been learned that these materials store sediment and create desirable habitat in the river. Most bank alterations of which we are aware have armored the banks with large rock. Sediment input from eroding banks was inventoried and a model sediment yield from this source developed.

The SBA was strengthened to point out the role of LOD and its depletion from the river (section 2.3.2.5.6.2, page 49). This is a habitat concern that cannot be addressed by the TMDL process.

Comment 57: Small streams run clear while the North Fork runs muddy. Wouldn't the tributaries run muddy if logging roads were the cause?

Response 57: Visual observations of sediment in streams, especially based on stream color, can be misleading. Sediment, especially large sediment particles (gravel and cobble), is transported episodically. Often such episodes are missed. It is a common observation that heavily roaded watersheds such as Steamboat Creek evidence a large amount of sediment entrainment during high discharge events.

Comment 58: Forest Service remedial efforts where LOD was added to the stream did not work.

Response 58: We agree these efforts did not work. The approach failure because the streambeds of the North Fork and its tributaries are destabilized by the large amount of bed load in-stream and because of the general lack of very large cedars which likely stabilized the North Fork prior to development. The SBA was strengthened to explain the LOD interactions (section 2.3.2.5.6.2, page 49).

Comment 59: A major contributor is dust from the adjacent roads.

Response 59: Dust from adjacent roads probably contributes some sediment to the North Fork. Based on an air quality analysis of road dust, the assumption of 100 trips per day over a 120-day season, and 18 miles of road adjacent to the river, 32 tons of dust would be generated. If all the generated dust entered the river, then 32 tons of sediment would enter the river. Even with this very conservative assumption that over-estimates the contribution, this is only 0.1% of the sediment load modeled for the river.

Comment 60: A recent likely major contributor is soil removal.

Response 60: Soil removal is a concern in the floodplain and especially on slopes above the river (Teacup Ranch). Since most of the removal has to date occurred on relatively flat grounds and has left a residue of large particles, it is not likely to be a large source of sediment. Removal of soils on slopes will be of greater concern.

Comment 61: Failure to comply with Idaho regulations pertaining to sediments. DEQ used modeling and guidance not in IDAPA 58:01.02-200.08. All parts of subsection 350 are not met.

Response 61: Section 200.08 of the Idaho Water Quality Standards (IDAPA 58:01.02-200.08.) prohibits sediment in quantities that impair designated beneficial uses. DEQ acted in compliance with this section of the water quality standards by using in-stream BURP data to demonstrate that the beneficial uses were impaired and that sediment was filling pools required by the beneficial uses. The modeling was used to estimate the amount of sediment yielded to the watershed. Section 350 of the Water Quality Standards controls enforcement of the standards and the evaluation and modification of best management practices with respect to nonpoint sources of pollution (Section 350.01.a ["Violations of water quality standards which occur in spite of implementation of best management practices will not be subject to enforcement action."], Section 350.01.b ["[F]ailure to meet general or specific water quality criteria, or failure to fully protect a beneficial use, shall not be considered a violation of the water quality standards for the purpose of enforcement."], and Section 350.02 [provides that if best management practices not met, enforcement actions can be pursued when narrative or numeric standards are violated]. Section 350 of the Idaho Water Quality Standards is not relevant to DEQ's determination of whether water quality meets the requirements of 200.08 or DEQ's development of a TMDL. Section 350, however, will be relevant to DEQ's implementation of the TMDL because it addresses the programs DEQ and other designated agencies will use to make those reductions from nonpoint sources necessary to meet water quality standards.

Comment 62: Use of models and guidance not appropriate in a regulatory context.

Response 62: See response to comment 61. The use of models and guidance to interpret water quality standards and develop TMDLs is clearly authorized by the CWA and state law. The Idaho Administrative Procedures Act allows agencies to develop and use written statements that pertain to an interpretation of a rule or to the compliance with a rule without going through formal rulemaking. Idaho Code section 67-5201(19).

Further it is DEQ’s position that a TMDL is a plan and not a regulation.

Comment 63: No direct monitoring of sediment inputs, yet time to complete this by 2003, page 10 [page 21 (section 2.3.2.3) in final document].

Response 63: Direct quantification of sediment is a most expensive and time-consuming undertaking. If carried out correctly, sediment monitoring should proceed through seven water years. The court schedule did not provide for a seven-year monitoring timeframe, nor does the state have the budget to monitor sediment in the numerous water bodies listed for sediment. The modeling approach was taken for this reason. These points will have been incorporated into the SBA at section 2.3.2.3 (page 21).

Comment 64: Explain "abundant evidence" page 17 section 2.3.2.3 [section 2.3.2.3.1, page 21 in the final document]. It is again noted that bed load is based on modeling not on monitoring. Is there any measure of current bed load not past? Important because current activities blamed for past activities.

Response 64: The “abundant evidence” is provided on pages 21-23 in terms of RASI and residual pool volume data. These data are supported by the model results.

Comment 65: Some discussion of the limitations of RASI should be provided, page 17 section 2.3.2.3.1 [section 2.3.2.3.1, page 22 in the final document].

Response 65: RASI is simply a method to estimate how much of the bed load of a stream is in motion during a two-year flow event. This method is explained in the text. Its limitations are based solely on the selection of point bars and measurements of particle sizes.

Comment 66: Limitations of residual pool volume should be discussed. page 19 section 2.3.2.3.2 [section 2.3.2.3.2, page 22 in the final document].

Response 66: The limitations of residual pool volume measurement are the number of stream feet assessed and the measurement of pool parameters. DEQ uses 20 times the bank full width, as explained in the text, as the number of stream feet assessed because hydrologic theory holds that a stream repeats itself in this reach length.

Comment 67: Many other factors listed could explain the difference in fish population densities between St. Joe and North Fork Coeur d'Alene River, there is time to explore these.

Response 67: The two factors believed by IDFG personnel to affect fish populations on a watershed-wide basis are fish harvest and habitat changes. In this case, the habitat change that the data points to is pool filling by sediment. Idaho Department of Fish and Game management personnel are of the opinion that fishing harvest regulations are better adhered to on the North Fork than on the St. Joe. This opinion points to the sedimentation. A SBA of the St. Joe River above the St. Maries River confluence has been completed by DEQ using a similar approach. This assessment found generally high fish densities and sufficient residual pool volume. The limited RASI data for this segment indicate a stable streambed. These results bolster the argument that sediment filling of pools in the North Fork Coeur d'Alene River is effecting fish populations adversely. Language was added describing the St. Joe River findings on page 26.

Comment 68: CWE method should be completely explained. What information is there on the condition of roads?

Response 68: The IDL, that developed the CWE, documents the method in full in its reports. These reports should have been referenced in the SBA. A reference to an IDL report documenting the CWE (IDL, 2000) has been added (section 2.3.2.5.1.2.1, page 35).

Comment 69: Problems are apparent with sediment model. 1) Cannot comment on applicability of the five reference watersheds 2) Why doesn't the Forest Service not know about failures? 3) Agricultural areas have no delivery route to the North Fork and should be zero. 4) It is hard to understand why burned areas have six times less sediment. 5) Road encroachment based on mean channel width; also fifty feet from the stream is not actual proof of stream in floodplain 6) Not appropriate to annualize events 7) Above shortcomings should be remedied with field surveys.

Response 69: 1) The five reference Belt rock watersheds were assessed in the Coeur d'Alene Lake and River (17010303) SBA (DEQ, 1999**)**. These watersheds all occur on similar Belt geology and in predominantly forested watersheds. Two, Wolf Lodge and Cedar Creeks, are across the ridge from the North Fork watershed. 2) These streams were assessed by CWE and constituted the best means to estimate the failures and CWE scores in the North Fork. The Panhandle National Forests have not developed a road failure survey. As the reference watersheds indicate, road failures are not a large factor on forested Belt terrain. This may be why the USFS has not invested in such a survey. 3) Agricultural lands are located next to the river in the floodplain. Close inspection will find micro-drainages to the river. The RUSLE model assumes stream delivery when agricultural lands are adjacent to a water body. 4) Areas that were heavily burned were not assessed to yield six times less sediment. Rather, these values are a correction bringing acreage that is treated as fully stocked up to the level of non-stocked. The rationale for this is that large double burn areas yield sediment for many years to streams. Latour Creek is an example of a stream with this phenomenon. The adjustment was deemed necessary by the sediment Technical Advisory Group (TAG) advising DEQ as to the best means to take such cases into account by the model. 5) As demonstrated in Appendix C, the mean channel width is developed from a very large data set. The sediment TAG attempted to develop this value continuously using a GIS approach and relations between stream bank full width and watershed size. This approach is at the edge of GIS capability (students at University of Washington are working on software to do this). For this reason DEQ defaulted to the mean bank full width approach. The 50-feet estimation was the parameter agreed upon by the sediment TAG. This is an assumption that will be verified in any road removal implementation along with a host of other considerations. 6) TMDLs are stated in mass per unit time. Thus, annualization is necessary for a pollutant that loads episodically. 7) The funding and time are not available to study the many issues brought up. These will be studied on a site-by-site basis as the plan to implement the TMDL is executed. These seven points have been clarified further in the document text.

Comment 70: Stream's bank and bed owner is the state of Idaho. If sediment is a problem, DEQ must address the problem by sediment regulations.

Response 70: The format by which any water quality limitation is addressed is clearly outlined in sections 303(d) and 303(e) of the CWA. This is to assess the problem, set goals for allocation of the pollutant of concern, and develop an implementation plan to meet these goals and allocations. This TMDL process is the process the state is following to comply with the CWA and a judicial order.

Comment 71: [What is the (m)Method of USGS measurement at Harrison.

Response 71: USGS measured suspended and bed load at Harrison. However, more pertinent data, from Enaville, is in the feasibility study for the North Fork. This information was from bed load and suspended load collection. The North Fork Coeur d'Alene River at Enaville data was used in the revised SBA text. The feasibility study and the USGS method from the remedial investigation and feasibility study documents are referenced.

Comment 72: The Idaho proposal will worsen flooding. The SBA does not examine the relationship between clear cutting and floods. The SBA prescribes cutting to remedy the situation and assumes receipts from timber sales can be used to fix road problems.

Response 72: The subbasin assessment does examine clear cutting and flooding. The flood frequency of the North Fork is analyzed on page 14 of the SBA (section 2.3.2.1.1). The analysis examines the peak discharge events over the past 62 years. It finds that the 1974 and 1996 high discharge events are the largest of record. The 1933 event is thought to be the largest flood of historic times based on photographic evidence and data from the Cataldo and Post Falls gauges.

The history of logging shows that clear cuts began in the 1940s and 1950s, intensified through the 1960s and 1970s, and decelerated into the 1980s. The flood history does not support the argument that clear cutting has caused greater flood discharges.

The SBA does not take a position on timber harvest. It clearly states this fact on page 53. It simply states that if timber harvest is pursued (a decision of the USFS, BLM, IDL, Louisiana Pacific, and numerous private landowners), the pollution credit idea suggested might be instituted to make road remediation a part of doing business.

The SBA was revised to further clarify that the data of high discharge occurrence does not support the contention that clear cutting increases flood frequency or high discharge event size.

Comment 73: Idaho would damage fisheries. By cutting more trees flooding would be worsened and more sedimentation would occur.

Response 73: This comment is based on the erroneous assumption of the comment 72. The flood frequency analysis and flood data do not support the contention of increased discharge. The data in hand do not indicate that cutting trees necessarily increases sedimentation markedly.

Comment 74: Idaho would further pollute Washington with toxic floods. Floods from the North Fork carry metals contamination through Coeur d'Alene Lake and into the Spokane River and Washington.

Response 74: The comment assumes that the SBA advocates timber harvest and by clear cutting. The comment further assumes that clear cutting creates greater discharges to the Coeur d'Alene River where metals contaminated sediments are entrained.

The SBA does not take a position on timber harvest. It clearly states this position on page 53. It simply states that if timber harvest is pursued (a decision of the USFS, BLM, IDL, Louisiana Pacific, and numerous private landowners), the pollution credit idea suggested might be instituted to make road remediation a part of doing business.

The flood frequency of the North Fork is analyzed on page 14 of the SBA (section 2.3.2.1.1). The analysis examines the peak discharge events over the past 62 years. It finds that the 1974 and 1996 high discharge events are the largest of record. The 1933 event is thought to be the largest flood of historic times based on photographic evidence and data from the Cataldo and Post Falls gauges. The history of logging shows that clear cuts began in the 1940s and 1950s, intensified through the 1960s and 1970s, and decelerated into the 1980s. The flood history does not support the argument that clearcutting has caused greater flood discharges.

The riverbed is filled with cobble materials caused by erosion. The presence of this cobble material has caused discharges of lesser magnitude that have resulted in more over-bank flooding, causing the impression that higher discharges have occurred with the proliferation of clear cutting.

We respectfully suggest that both assumptions upon which the comment was based are in error.

Comment 75: The support of fish is based on three narrow criteria in the TMDL. The TMDL does not take into account other factors such as how fish introductions affected fish populations in the North Fork.

Response 75: The TMDL is designed to address only the pollutant of concern, which in this specific case is sediment. We agree that many other factors affect fish populations. These include non-native fish introductions, habitat alteration, and fishing pressure, among others. The TMDL implementation plan will acknowledge these other factors and either make provision for them or set surrogate measures of sediment control that, once met, will meet the TMDL. This has been clarified in the SBA.

Comment 76: A TMDL should not be developed for excess sedimentation.

Response 76: The TMDL is developed for that sediment which is estimated to be in excess of the watershed's ability to attenuate the sedimentation. This value is set at 50% above background, because the upper basin, which is supporting its uses, is at 43% above background and the Washington Forest Practices Board guidelines (1995) find no deleterious effect to water quality under 50% above background.

Comment 77: Since the root parameter of concern is hydrologic modification, section 303(d)(1)(A) cannot be used as an authority to develop the TMDL for segments impacted by nonpoint sources and habitat alteration.

Response 77: The SBA finds that sediment is the pollutant of concern not hydrologic modification. Sediment is a pollutant that can be allocated on a mass per unit time basis in a TMDL.

Comment 78: None of the sedimentation mechanisms outlined on pages 43-44 [pages 45-48 in the final document] can be classified as point source pollution. Section 319 CWA should be used to address nonpoint sources.

Response 78: DEQ disagrees that TMDLs are only required for waters impaired by point sources. TMDLs are a part of the water quality-based approach under section 303 of the CWA that is clearly not limited to point sources. For additional clarification, see Pronsolino v. Browner (2000) and Response to Comments regarding the TMDL for dissolved cadmium, lead and zinc in the Coeur d'Alene River Basin at pages 57 to 60 (EPA-DEQ 2000).

In addition, Idaho law clearly requires TMDLs to address both point and nonpoint sources of pollution (Idaho Code sections 39-3602(27) [defines TMDL to include load allocations for nonpoint sources] and 39-3611[directs development of TMDLs to control point and nonpoint sources of pollution]). The segments of the North Fork Coeur d'Alene River are listed on both the 1996 and 1998 Idaho 303(d) water quality limited segments list. The SBA for the North Fork confirmed that the waters at issue do not meet state water quality standards. Therefore, TMDLs are required under CWA section 303(d).

Comment 79: The TMDL does not address the high volume of water discharge from the North Fork Coeur d'Alene River watershed. It is not explained how the discharge affects mitigation efforts. It does not address how the large volumes of waters affect the fisheries. There is no indication of how fishery habitat will improve. These contentions are backed by USGS discharge data. This data covers the peak flow events between 1995 and 1999.

Response 79: The flood frequency of the North Fork is analyzed on page 14 of the SBA (section 2.3.2.1.1). The analysis examines the peak discharge events over the past 62 years. It finds that the 1974 and 1996 high discharge events are the largest of record. The 1933 event is thought to be the largest flood of historic times based on photographic evidence and data from the Cataldo and Post Falls gauges. The history of logging shows that clear cuts began in the 1940s and 1950s, intensified through the 1960s and 1970s, and decelerated into the 1980s. The flood history does not support the argument that clear cutting has caused greater flood discharges.

The riverbed has filled with cobble materials caused by erosion. The presence of this material has caused decreases in discharges that have resulted in more over-bank flooding, causing the impression that higher discharges have occurred with the proliferation of clear cutting.

Although the flood frequency analysis does not support higher discharges due to vegetation removal (clear cuts) in the main river system, this may occur on first and possibly second order tributaries in the watershed. The effect is lost by the desynchronous snowmelt as watersheds become larger. Unfortunately, no long-term stream gauging has been completed on the first and second order tributaries as it has been at Prichard and Enaville.

The SBA was strengthened on page 14 to point out that peak discharges may be altered in the first and second order watersheds with the caveat that no direct data is available to support this suspicion.

Comment 80: Pulling culverts does not address and making roads infiltrating surfaces will not address the high discharges.

Response 80: We respectfully disagree. Any measure that causes water to infiltrate into the shallow ground water system rather than to run off will decrease discharge.

Comment 81: The assessment finds streambed instability and pool filling, yet DEQ’s policy not to address flow alteration and habitat modification will not address this streambed instability.

Response 81: The issue that can be addressed by a TMDL is sedimentation of pools. The instability is, in our opinion, caused by sediment loadings in excess of 100% above background (in some watersheds up to 200% above background). Flood frequency analyses indicate that discharges are not remarkable higher or more frequent after clear cutting (see page 14).

Comment 82: Issues concerning the technical correctness of the WATSED model are raised by the comment.

Response 82: The WATSED model was not used as the sedimentation model. The coefficients that WATSED employs for forestland sediment yield were used. The assessment incorrectly identified these as WATSED coefficients which caused this confusion. These coefficients are now correctly identified as mean coefficients developed from in-stream sediment measurements on Belt terrain of northern and north central Idaho.

Comment 83: Channels do not recover immediately after hill slope recovery. This lag applies to heavily logged portions of Shoshone, Yellowdog, Flat, Steamboat and the Little North Fork. The assessment does not take into account the time required for this recovery.

Response 83: The model used in the assessment does not deal with stream channels. The model considers the yield of the pollutant of concern (sediment) to the streams of the watershed only. We agree that impacts have occurred to stream channels and habitat; however, these are not impacts judged by EPA and the state to be applicable to TMDL treatment. Certainly, in any TMDL implementation plan to address excess sedimentation, the state will urge the USFS to adopt a holistic view to manage the landscape and stream continuum. However, the ability of the state to require habitat restoration is limited in the TMDL process.

It was clarified in section of the SBA (section 2.3.2.5.6.4, page 50) that factors other than sediment should be addressed holistically in any implementation plan.

Comment 84: The TMDL will not meet the "fishable" goal of the Clean Water Act or the NFMA [National Forest Management Act].

Response 84: The TMDL is designed to address the pollutant of concern, which is sediment. The fishability of a stream is dependent on excess sedimentation, but also on a number of other potential constraints such as fishing pressure, loss of habitat, loss of LOD, introduction of competitor or predator species, etc. Unfortunately, a TMDL can only deal with water quality pollutants of concern and not the many other factors that make streams "fishable." The fishable goal is fishable within the constraints of the CWA that addresses but a single component the complex habitat of fish.

A discussion was placed in the SBA (section 2.3.2.5.6.4, page 50) on the limitations of the CWA and TMDL in particular.

Comment 85: Logged watersheds have higher discharge during rain on snow events and the affect persists out to 68 years.

Response 85: This comment is a follow-up to a comment made on an earlier version of the SBA. The flood frequency analysis does not support this assertion as stated in response to an earlier comment (comment 55). The clear-cut acreage values, provided in your comment of May 2, 2000, clearly demonstrate that clear-cut acreage has increased for the 68 years since 1933. Yet the 1996 high discharge event did not have as large a discharge as the 1974 high discharge event, and that event is believed, based on photographic evidence and Post Falls and Cataldo gauge data, not to have been as large as the 1933 event. This pattern is contrary to the thesis that logged watersheds have higher discharge during rain on snow events.

Comment 86: Sentences on flow alteration provided for the record. From Section 1 page 2 of U.S. Forest Service Hydrologic Effects of Vegetation Manipulation Part II Haupt, H. F. et. al. 1976.

Response 86: This material is noted. The SBA has been altered to indicate that discharge alteration is possible, but unproven, in the first and possibly second order tributaries. However, the flood frequency analysis clearly indicates that this effect is soon diminished in the larger order streams and is not detectable at the USGS gauge sites.

Comment 87: RASI Indices located on pages 14 and 15 (page 22 in the final document). The interpretation of RASI is that bed particles move in high percentages is related to high flows and not road construction.

Response 87: RASI measurements indicate the percentage of the particle size distribution moving in-stream during the two-year flow event. The reason for that movement may be varied. It may be a function of stream power, but it may also be a function of increased sediment yield to the stream.

Comment 88: Land use data located on pages 21-27 (pages 27-33 in the final document). Tables leave out the number of acres that have been logged by Forest Service timber sales.

Response 88: DEQ was advised by its sediment technical advisory group that forest acres that had been harvested, but that were now fully stocked with young trees, seedlings, and saplings, do not yield sediment at any greater level than areas in coniferous forest. A model was run assigning land types in seedlings and saplings a higher sediment yield to verify the magnitude of the difference. The difference was found to be a small component of the sediment source. For these reasons, DEQ modeled land use contribution of sediment by assigning non-stocked areas the maximum value of the sediment yield range for coniferous forest on Belt geology, while all other forestland was assigned the mid-range value. These details of the modeling are described in Appendix C.

Comment 89: Forest Land sediment yield and export located on page 28 (page 34 in the final document). Comment on the correctness of the WATBAL model.

Response 89: The sediment yield coefficients were incorrectly referred to in the SBA as the WATSED coefficients. This has been corrected. The coefficients are the mean coefficients for Belt geology developed from in-stream sediment measurements in northern and north central Idaho. The mis-identification led to the mistaken idea that WATSED and WATBAL were used to estimate sediment yield. This is not true.

Comment 90: Sedimentation mechanisms located on page 38 [page 45 in the final document]. Sentence near bottom of page is not clear in that it ascribes channel instability to stream power and sedimentation. Regenerative logging is adding to stream power and is important in stream instability. It appears some sentences are missing.

Response 90: The missing sentences have been restored (section 2.3.2.5.4, page 45).

Comment: Vegetation alteration located on pages 39-48 [page 46 in the final document]. The federal and state laws that the Forest Service must comply with are listed. The assessment does not address watersheds the Forest Service classifies as nonfunctional or functioning at risk. Issues are stated with Forest Service NEPA [National Environmental Policy Act] documents. There is no discussion in the assessment of why the damage happened. Would not a literature search and review of Forest Service documents be appropriate? TMDLs that deal with sediment alone and do not address bed load sediment will not meet the requirements of the CWA.

Response 91: The SBA addresses the listed pollutants of concern. It does not delve into the many federal or even CWA requirements the USFS is required by federal law to adhere to. The SBA must remain focused on the pollutants of concern and it must make the case that the pollutants are impairing beneficial uses.

Comment 92: Pollution control strategy located on page 44 [page 52 in the final document]. Additional timber sales will not solve the water quality problems of the North Fork Coeur d'Alene watershed.

Response 92: The Pollution Control Strategy section (section 2.4.2, page 52) suggests two methods by which the sediment yield might be controlled. One of these would require timber harvest. The SBA has been modified to not take a position on timber harvest. It clearly states this position on page 53. It simply states that if timber harvest is pursued (a decision of the USFS, BLM, IDL, Louisiana Pacific, and numerous private landowners), the pollution credit idea suggested might be instituted to make road remediation a part of doing business.

Comment 93: Fish density measurements do not address sediment impacts. What other data was collected with the fish surveys? Several factors affect fish density.

Response 93: A SBA must assess all the available data concerning the watershed, including fisheries data. Fisheries data gathered by DEQ were collected separately from BURP program. The University of Idaho, IDFG, and USFS collected a considerable amount of the data as cited. The BURP data contain only fish tally data and a few other parameters concerning the electrofishing. Very little other data is collected with the fishery data in general.

Comment 94: Pollution sources such as splash dams, log drives, hydraulic and placer mining, LOD removal by riparian harvest and/or flood control and hydraulic modifications have not been addressed. These have added sediment to the stream that can take decades or centuries to route through the system (several papers cited).

Response 94: The sources listed above were mentioned but not adequately addressed. The SBA was modified to better address these influences (section 2.3.2.5.6, pages 48-50). However, none of these influences are adding the pollutant of concern, sediment, to the river at this point. The lack of LOD because of removal is affecting habitat, but the TMDL does not address habitat, or for that matter, the fate and transport of the pollutant of concern, sediment, in-stream. These influences have been noted more fully in the SBA, but the SBA must concentrate on sediment sources now not those of the past.

Comment 95: Rivers transport large volumes of sediment naturally. Pools are a transit feature of streams. Many features of the stream other than sediment control pool volume and frequency.

Response 95: We agree with the general statements of this comment; however, streams can receive too much sediment. Based on the best studies we have available, this threshold is between 50% and 100% above background. It is clear from observation of the Coeur d'Alene River at Kingston and comparison of the current situation with the historical descriptions (Russell, 1985) that the sediment load to the North and South Forks has increased markedly. The sediment yield model, used in the assessment and independently verified to be in the proper range with USGS measurements, indicates the increase is over 100% of background in most of the sub-watersheds of the North Fork. Increased sedimentation is a cause of pool filling. Since sediment is a pollutant of concern for which TMDLs must be developed, the assessment can come to but one conclusion.

Comment 96: Riffle armor stability (RASI) is not a published peer review method. RASI values provided do not correlate with residual pool volume measurements provided. RASI, pool volume and fish densities are compared indicating the three cannot be correlated with any strength. The data indicates an opposite trend. The data do not support the conclusions of the TMDL. The data is incorrectly interpreted, it is suggested the sediment TAG be reconvened to discuss the data.

Response 96: The RASI method is considered by DEQ to be a good technique for providing information about the streambed sediments. We have no guidance on the use of any method based on peer review. The correlation between RASI, residual pool volume, and fish population explains only a small percent of the variation in the North Fork data set or, for that matter, in the entire data set for the Coeur d'Alene Lake and River, Rathdrum-Spokane, North Fork, or St Joe HUCs. As stated in the response comment above, it cannot be expected that a significant correlation could be developed between sediment impact surrogates such as RASI, residual pool volume, and fish density. Such a correlation would presuppose that the electrofishing was completed at that exact time when that environmental factor was limiting (Barthalow, 2000) This is unlikely. DEQ believes it can use a weight of evidence approach to demonstrate sediment impact. The sediment TAG was formed to develop a sediment model, not to decide on the weight of evidence that a listed stream is impaired. Such final decisions are reserved for DEQ and EPA.

Comment 97: Residual pool volume is controlled by many factors. The TMDL does not address the many factors (listed), which affect pool volume in a stream. No correlation between fish density and pool volume can be found. The data presented in this TMDL does not properly or correctly address bed load transport process and sediment transport through gravel cobble river systems.

Response 97: As stated in the responses above, the TMDL addresses the pollutant of concern: sediment. Residual pool volume and fish density correlations are addressed in the response to comment 96. The TMDL addresses only sediment sources and does not address the fate and transport of the pollutant in the stream system. Adequate models are not available in our opinion to address the fate and transport of sediment, especially bed load sediment. The key to any pollutant control is to control the source not the fate and/or transport. The TMDL addresses the pollutant sources, limiting these sources to yearly loads.

The SBA was changed to further clarify the pollutant addressed by the TMDL and the features of the stream that are not.

Comment 98: The SBA ignores basic principles of stream channel hydraulics and bed load sediment transport. The SBA ignores a century of impacts, ignores the introduction of fish species. The comment points out that Chinook salmon spawn successfully in the North Fork during the fall and winter.

Response 98: The comment on channel hydraulics and bed load sediment is addressed in comment 94. A TMDL addresses pollutant sources, not fate and transport. The level of sediment in this TMDL is addressed using the Washington Forest Practices Board guidelines as the best available knowledge (1995). Issues such as habitat alteration and fish introduction are not issues to which TMDLs are applicable. We agree that Chinook salmon appear to spawn successfully in the lower Coeur d'Alene River. It is not known if Chinook populations are affected by high flow events. Little is known about its relative spawning success in the Lower North Fork. The SBA was augmented to address the century of impacts (see section 2.3.2.5.6; page 48).

Comment 99: The SBA uses residual pool volume as an indicator, yet it is an indicator of habitat alteration that DEQ and EPA indicate is not applicable to TMDL treatment.

Response 99: The SBA uses residual pool volume as an indicator of the influence of the pollutant of concern, which is sediment. The TMDL does not attempt to allocate residual pool volume, but allocates the pollutant. The comment confuses the SBA with the TMDL allocations.

Comment 100: The data should be subjected to standard statistical analysis.

Response 100: This is an unrealistic standard because it pre-supposes that correlation is possible, when the measurements of fish density would be required at the exact time that a feature such as residual pool volume is limiting (Barthalow, 2000). DEQ uses a weight of evidence approach to identify the problem, then uses models to determine sedimentation rates. The sediment yield model results are verified using independent measurements known to be in the correct range.

Comment 101: The impacts of historical sedimentation have not been fully taken into account.

Response 101: As stated in response 94, historical sediment sources now have a fuller explanation in the SBA. However, the TMDL is not concerned with historic sediment sources. It is concerned with current sources that verified modeling demonstrate are well above the level expected to cause water quality problems. The TMDL addresses pollutant (sediment) sources, not history. This is a limitation of the TMDL approach.

Comment 102: Bed load monitoring should be instituted and monitored on an annual basis.

Response 102: DEQ does not have the resources to support bed load monitoring in a watershed as large as the North Fork Coeur d'Alene River. If sediment monitoring were required on all the sediment-impaired streams in Idaho, it strain financial resources. The North Fork is not special in this respect. To meet the court-imposed deadlines, a sediment modeling approach must be taken.

Comment 103: A sentence or two should be added (p3) that flood events may occur occasionally on individual low order tributary streams and these may add additional bed load.

Response 103: Language indicating that fist and second order watersheds may experience peak flows due to vegetation modification has been added to the flood frequency section (section 2.3.2.1.1; page 15) of the SBA.

Comment 104: The assessment focuses on sediment and does not address streambed movement and instability, peak flows from canopy removal and bed load movement.

Response 104: The SBA focuses on sediment because sediment is the pollutant of concern. Bed load movement and instability are habitat issues that may be exacerbated by excess sedimentation. Peak discharge alteration was not demonstrated by the flood frequency analysis, but is a matter of flow alteration. Canopy removal, like riparian logging impact on LOD recruitment, is an issue of habitat alteration. The issues raised are matters of either habitat or flow alteration, both of which have been deemed by DEQ and EPA beyond the scope of TMDLs because these effects cannot be allocated in mass or energy per unit time.

Comment 105: The assessment does not provide an explanation of how the damage occurred. The assessment needs to explain how new road construction will not cause additional damage. It is not clear that the stakeholders endorse the proposal.

Response 105: The SBA contains this information, but it is within the model interpretation (See pages 35 and 36). It is clear that roads that encroach on streams, and to a lesser extent stream crossings, are the major sediment contributors. This is not to say that non-stocked forest acres, mass failures, and other sources are not site specific problems, but these are minor sediment sources. The construction of new roads will be with methods and in locations that will solve these problems. In many cases, old roads must be removed. These issues are covered in the pollution control strategy. The stakeholder agreement was on sediment model development. That model was then applied and the sources identified. The SBA has been modified to further clarify the sources.

Comment 106: The SBA concludes that a sediment TMDL is not needed for Beaver Creek because fish density and residual pool volumes are similar to reference streams. Provide the reference stream studies.

Response 106: The reference stream data is provided in Tables 13 (residual pool volume) and 14 (fish density). These data for reference and listed streams are drawn from the BURP database and various fishery studies referenced in Tables 13 and 14, respectively. Buckskin Creek is the control stream of the most analogous size to Beaver Creek. Beaver Creek appears to have adequate residual pool volume, while its fish density and composition are similar with control stream.

Comment 107: Section 2.3.1 fails to specifically identify active clear cut logging that continues in the North Fork. A Forest Service memo shows the clear-cut acres that have been logged. This information should be incorporated in the SBA.

Response 107: We disagree. Clear cut logging over 40 acres is rare in the forest. The contention is made that clear cuts add remarkably to sedimentation; however, modeling with all non-stocked, seedling and sapling cover types assigned the highest sediment yield coefficient for coniferous forest on a Belt geology demonstrated only marginally higher sediment discharge to the streams. The strongly held conviction that clear cuts themselves markedly increase sedimentation does not hold up to analysis. These points were expanded on in the SBA. The level of land treatment over the history of the forest is estimated in section 2.1.2 (page 7).

Comment 108: Section 2.3.2.3.2 indicates that poor residual pool volume is due to channel instability. What are the causes of the channel instability?

Response 108: The causes of channel instability can be stream power or excess sedimentation as explained in section 2.3.2.5.4 (page 45). The flood frequency analysis does not support higher than normal discharges based on existing data from the gauges and the flood history. The assessment has been revised to suggest that first and second order tributaries might have higher discharges after harvest but no data fully supports this. Such effects are de-synchronized in the larger watershed. The model clearly indicates excess sedimentation. The SBA comes to the conclusion excess sedimentation is the most likely cause of bed instability and pool filling, and the sediment TMDL addresses that sedimentation.

Comment 109: Section 2.3.2.4 indicates that trout densities have declined due to angler pressure while USFS EIS [Environmental Impact Statement] ascribes it to habitat alteration. Information from the EIS should be included in the SBA.

Response 109: The SBA considers fishing pressure as a possible cause of low densities; however, the SBA is clear in ascribing low trout density to sedimentation. DEQ would rather draw its own conclusions based on the data rather than to rely on others' interpretations of the data. Regardless, the SBA came to the same conclusion as the USFS EIS.

Comment 110: Suggest more information on vegetation manipulation and its impact on flows.

Response 110: The flood frequency analysis and flood data do not support the contention that vegetation manipulation has altered discharge on a large basin basis. The flood frequency of the North Fork is analyzed on page 14 of the SBA. The analysis examines the peak discharge events over the past 62 years. It finds that the 1974 and 1996 high discharge events are the largest of record. The 1933 event is thought to be the largest flood of historic times based on photographic evidence and data from the Cataldo and Post Falls gauges. The history of logging shows that clear cuts began in the 1940s and 1950s, intensified through the 1960s and 1970s, and decelerated into the 1980s. The flood history does not support the argument that clear cutting has caused greater flood discharges basin wide.

The riverbed is filled with cobble materials from erosion. The presence of this material has caused discharges of lesser magnitude that have resulted in more over-bank flooding, causing the impression that higher discharges have occurred with the proliferation of clear cutting.

Higher discharge may occur in first and second order tributaries, but no data exist to support this contention. We have found the belief that clear cutting increases discharges in the Coeur d'Alene basin to be firmly held, but with little evidence to support it. The SBA was altered in many places to clarify this picture.

Comment 111: Would it be helpful to further describe the specific control efforts taken in the Steamboat Creek watershed?

Response 111: These controls were road removal actions. This fact was noted in the Control Actions to Date section (section 2.4.1; page 51). It was noted that the Autumn and Martin Creek actions were road removal actions.

Comment 112: To understand the cost of road removals it would be helpful to include additional details on the number of feet of roads to be removed and the costs.

Response 112: This assessment was not made directly for the SBA modeling, but estimates are available in the GIS coverages. It would be premature to make such an assessment at this time since the estimates require ground truthing. Such an estimate is much more reasonable as a part of the implementation plan.

Comment 113: Other pollutant control alternatives should be considered because this pollution control effort would not lead to attainment of water quality standards.

Response 113: We respectfully disagree that with the commenter's assertion that road removal pollution control strategy would not work. Model results based on the most current GIS databases clearly point to encroaching roads and road crossings as the major sediment source to the North Fork watershed. The record indicates, and is supported by model results, that if roads are properly sited and constructed, sediment yield from them is a small fraction of that from improperly sited and constructed roads. The USFS has demonstrated road removal is effective. The only outstanding question is how to pay for it. Road removal is a tested technology that must be paid for by some funding mechanism; two are mentioned in the SBA, including an innovative suggestion originally made by a Watershed Advisory Group member. However, it is not for DEQ or EPA to decide such funding issues directly.

Comment 114: Sediment impacts in the North Fork Coeur d'Alene are primarily bed load impacts to salmonid spawning through filling of habitat as well as physical injury to redds. Are sediment reductions, fines, bed load or total sediment yield?

Response 114: Sediment reductions in the TMDL are total sediment yield reductions. It should be clarified that the sediment impact is suspected to be pool filling. Fine sedimentation of redds does not appear to be a problem, as young of the year are detected in most tributaries, which is where spawning occurs.

Comment 115: The TMDL should consider using course sediment targets i.e. pool frequency targets, residual pool volume targets, depth fines target.

Response 115: We do not agree the allocation should use surrogates of sediment mass per unit time. We do agree that residual pool volume targets would be of value in the implementation plan. The SBA and TMDLs indicate that the implementation plan should contain residual pool volume targets.

Comment 116: On page 23, section 2.3.2.5 [page 26 in the final document], the sediment section should include a "front end" introductory piece that provides some background information and information on modeling assumptions.

Response 116: The model assumptions are laid out in section 2.3.2.5.1, pages 34 through 36. Since the model assumptions and its documentation are so important, we have expanded this discussion greatly in Appendix C. More discussion would burden the basic thrust of the SBA.

Comment 117: On page 31, section 2.3.2.5.1.1.1 [page 34 in the final document], agricultural land was not incorporated into the analysis. Yet grazing in the lower basin.

Response 117: In the case of the North Fork Coeur d'Alene River, the agricultural land is all grazing land. The RUSLE coefficients are applied to this land in the Little North Fork and the lower North Fork sub-watersheds. Grazing is not practiced elsewhere to any great extent.

Comment 118: On page 31, section 2.3.2.5.1.1.1 [page 34 in the final document], the TMDL should say where/why the agricultural sediment yield coefficients were applied.

Response 118: The agricultural coefficients are applied to the grazing land. This has been clarified in the SBA.

Comment 119: On page 31, section 2.3.2.5.1.1.3 [page 35 in the final document], the TMDL indicates paved roads were assigned a sediment yield coefficient at the low end for the Belt geologic type. The assessment should rationalize this coefficient and refer to table 15.

Response 119: This assumption is rationalized in Appendix C. Its use is clarified in the SBA.

Comment 120: On page 42, first paragraph and section 3.1.4, the TMDL fails to adequately define how background sedimentation was calculated. Natural and background sedimentation rates are confused.

Response 120: Natural and background sedimentation rates were used interchangeably as the amount of sediment yield expected from the fully forested watershed. We believe this was explained in the text; however, this point has been further clarified in the SBA and TMDL.

Comment 121: On page 42, first paragraph and section 3.1.4 [section 3.1.4, page 57 and 58 in the final document], the TMDL should provide an explanation of why 50% above background was selected as the goal when 50% is still in the chronically detectable range. The TMDL should show how 50% does not affect the beneficial uses.

Response 121: The TMDL cites the Washington Forest Practices Board guidelines (1995). These guidelines indicate clear water quality problems above the benchmark of 100% above background and the possibility of chronic effects between 100% and 50% above background. Below 50% above background they speak only to "detectable" sediment. To our knowledge, sediment is always detectable in streams, since it is a natural component of streams. DEQ reads the Washington Forest Practices Board guidelines (1995) to clearly indicate that water quality problems below 50% above background do not occur. These points are made clear in section 3.1.4.

The TMDL on page 57 was further expanded to show that the Upper North Fork subbasin supports its beneficial uses and is at 42.8% above natural background. This information is used to further support the goal of 50% above background.

Comment 122: On page 43, section 2.3.2.5.3 [section 2.3.2.5.2, page 45 in the final document], a residual pool volume target may be necessary.

Response 122: See the response to comment 115. We expect to recommend this for the implementation plan, but the allocation (TMDL) must address mass per unit time as is required in federal regulations.

Comment 123: The summary fails to identify timber extraction activities as a source of sedimentation in the watershed.

Response 123: Timber extraction is a fuzzy term. The assessment deals with all aspects of timber extraction. It provides higher yield coefficients for non-stocked forest acres (those not replanted and established) and it addresses roads on which timber is exported. Timber extraction, as the actual removal of the logs, has no identified, quantifiable impacts other than these. The summary was assessed to make clear the removal of vegetation from landmasses and the impacts of roads are addressed. It is unlikely the term timber extraction itself will be used.

Comment 124: In section 3.1.4, Loading capacity [page 57 in the final document], Table 3 [Table 4, page 12 in final document], Table 17 [Table 18, page 44 in final document] in Section 2, table 3 [Table 22, page 58 in final document] in Section 3 and table 13 [Table 32, page 66 in final document] in section 3 are all different. These tables should all be consistent.

Response 124: These tables are different for a reason. Table 17 [Table 18, page 44 in final document] is the model results for the major subbasins of the watershed. Table 3 [Table 22, page 58 in final document] is the loading capacity, the load allowable at the point of compliance in tons per year. Table 13 [Table 32, page 66 in final document] is the estimated reduction necessary upstream of the point of compliance in tons per year. Simple subtraction demonstrates the modeled sediment at the point of compliance minus the loading capacity. The tables and their distinctions are further clarified in the SBA and sediment TMDL.

Comment 125: In section 3.1.8, Table 13 [Table 32, page 66 in final document], subbasin sediment allocation Table 13 does not indicate how the existing sediment load was calculated. The TMDL should clearly state how the percentage load reduction was calculated.

Response 125: The table takes the modeled sediment yield from the watershed above the point of compliance and subtracts the loading capacity at the point of compliance. This point has been clarified in the TMDL.

Comment126: It is unfortunate that so little sediment delivery data has been developed for the North Fork Coeur d'Alene River. Background estimates are based on WATBAL and WATSED coefficients Has WATBAL or WATSED been validated? Neither model is considered to provide accurate estimates of sediment loading from roads and openings.

Response 126: The SBA and the TMDLs must be based on the best available data. It is unfortunate that more data is not available, but the TMDL must be developed on the data that exists.

The WATSED and WATBAL models were not used in the sedimentation model. The coefficients that WATSED employs for forestland sediment yield were used. The assessment incorrectly identified these as WATSED coefficients causing this confusion. The coefficients have been correctly identified as mean coefficients developed from in-stream sediment measurements on Belt terrain of northern and north central Idaho.

Comment 127: It’s a hydrological fact that destruction of pool and other habitat and bed load movement are directly due to more frequent natural peak flows. A direct correlation has been established between higher more frequent flood events and canopy removal and road density.

Response 127: We respectfully disagree that "a direct correlation has been established between higher more frequent flood events and canopy removal and road density." The flood frequency analysis developed from the existing gauge data (page14) indicates that the 1974 and 1996 floods are the largest in the analysis of the Enaville and Cataldo gauges. The 1933 flood appears to have had a higher discharge based on photographs and Post Falls and Cataldo discharge data. Thus the three largest discharges were 1933, 1974, and 1996, in that order. The canopy removal and road construction in the North Fork have increased steadily since 1933, probably peaking in the early 1980s. If these factors increased discharge on a basin-wide basis, the opposite flood history would be expected. Flood discharge appears to be weather related and not a management related phenomenon based on the available data.

It is suspected that peak discharges may be altered by management actions in the first and second order tributaries of the watershed. Discharge is not de-synchronized in small watersheds as it is by the complex slopes and aspects of the larger watershed. Unfortunately these streams have no long-term stream discharge gauging covering large discharge events, so this suspicion cannot be proven.

The SBA has been strengthened on page 15 to point out that peak discharges may be altered in the first and second order watersheds with the caveat that no direct data is available to support this suspicion.

Comment 128: The commenter disagrees with the assumption that the impacts on water quality of canopy loss resulting from fire under natural conditions are equal to canopy loss from logging. Point out that WABAL and WATSED have not been verified; question coefficients used.

Response 128: The fire areas that were modeled to be equivalent to non-stocked areas are not typical fire areas as is pointed out in the Model Assumptions and Documentation (Appendix C). These are areas that have suffered double fire events within a decade or two of each other. Areas like these lose most woody material in the second fire. Pictures of this type of burned area may be viewed in Russell's *North Fork of the Coeur d'Alene River* (1985). It takes these areas many years to re-establish a forest cover and during this period have higher sediment yields. The model accounts for these areas loading to the stream over time by adjusting the yield coefficient to that of a non-stocked area.

The WATSED model was not used in the sedimentation model. The coefficients that WATSED employs for forestland sediment yield were used. The assessment incorrectly identified these as WATSED coefficients causing this confusion. These have been correctly identified as mean coefficients for Belt geology developed from in-stream sediment measurements in northern and north central Idaho.

The sediment yield adjustment for double burn areas and identified sediment yield coefficients as mean coefficients developed from in-stream sediment measurements on Belt terrain of northern and north central Idaho has been further clarified in the SBA.

Comment 129: The sediment TMDL deals with sediment sources but does not address the main problem of channel instability caused by peak flows.

Response 129: The sediment TMDL deals with the pollutant of concern, which is sediment. This is not to say that other factors do not affect the stream. Although the data does not support peak flow alteration on a basin-wide basis, elements such as LOD removal and lack of LOD recruitment clearly affect habitat and bed load mobility. These features are important but cannot be addressed under TMDLs. DEQ will urge development of a TMDL implementation plan that takes a broader view of these habitat issues that the narrow focus of the TMDL pollutants of concern.

The SBA was strengthened to point out the many habitat problems the TMDL itself does not address.

Comment 130: The commenter believes extrapolation of Washington State Forest Practices Board guidelines to Idaho watersheds is not warranted.

Response 130: The Washington Forest Practices Board guidelines (1995) are the published reference that both EPA and DEQ use to compare model results to the probability of water quality violation. It constitutes the best available information on which TMDLs must be based.

Comment 131: How will the "finite ability to process sediment" be determined?

Response 131: As stated in the TMDL, it will be determined by bio-monitoring the cold water biota. When the cold water biota meet the criteria stated in the TMDL, that finite ability to process sediment will be defined. This is further explained in the sediment TMDL (section 3.1.6, pages 58 and 59).

Comment 132: Why was the goal not set at 43% and what were the criteria for the reference streams? The choice of reference streams is not documented enough to confirm that they were scientifically based.

Response 132: The goal was set at 50% above background by the North Fork Watershed Advisory Group after being advised that above 50% above background sedimentation rate the Washington Forest Practices Board guidelines find a potential for chronic water quality problems (1995). Below 50% above background these guidelines do not show problems. Since these are all modeled numbers, there is likely not a large difference between 50% and 43% above background. The control streams are all located in the lightly roaded and lightly harvested Upper North Fork subbasin. These watersheds range from having no to little development owing to large fires that swept the area early in the twentieth century. It has been clarified in the SBA that the control streams and control areas are all in the Upper North Fork subbasin. The level of development in the upper North Fork has been further clarified in the SBA.

Comment 133: The criterion, three age classes one young of the year, is totally inadequate as a criterion for salmonid spawning.

Response 133: We respectfully disagree. This is criterion indicates population structure and that reproduction is occurring. It is one of the metrics used in the WBAG2 to develop the fish index. DEQ believes it is a sound indicator of salmonid spawning.

Comment 134: Explain why tailed frogs and sculpin are indicators of cold water biota.

Response 134: Tailed frogs and scuplins are the two cold water vertebrate species common in waters not impaired by chemical pollutants. The SBA better explains the status of tailed frogs and sculpin in these watersheds.

Comment 135: Macroinvertebrate biotic index of 3.5 is questioned as a measure of cold water biota.

Response 135: A macroinvertebrate biotic index score of 3.5 or greater is used by the WBAG to indicate a stream with healthy macroinvertebrate diversity. The WBAG2 uses a stream macrobiotic index (SMI) based on the percentile of reference streams with 3 as the highest rating. Comparison of the two methods indicates that a stream with a macroinvertebrate biotic index score of 3.5 would have a SMI of 3 indicating healthy macroinvertebrate diversity.

Comment 136: The criterion that needs to be added to judge success is habitat improvement.

Response 136: The TMDL can only address the pollutant of concern, which in this case is sediment. As explained in earlier comments, the TMDL process is not designed to address all the ills in streams. It is designed to address pollutants of concern that can be quantified in mass or energy per unit time. Habitat, which we agree is important to the biota, does not meet this criterion. DEQ and EPA have decided that habitat is not a characteristic for which TMDLs can be developed. The SBA clarifies that sediment, not habitat alteration, is the pollutant the TMDL must address.

Comment 137: Given the lack of a TMDL implementation plan there does not appear to be "reasonable assurance" that the TMDL will be implemented.

Response 137: The reasonable assurance language was requested by EPA. In the case of the North Fork, sediment implementation planning will be led by the USFS, the prime manager of the watershed. The federal land management agencies have agreed by memorandum of agreement to lead the development of implementation plans in watersheds where they manage the majority of the land. The sediment implementation plan is expected 18 months following approval of the TMDL. The metals TMDL implementation plan is the state of Idaho's cleanup plan. This plan currently exists.

**4.4 Miscellaneous Comments**

Comment 138: The hydrograph in section 2.1.1.2 is developed for data through 1997. Why not for data through 1999 or 2003?

Response 138: This hydrograph was updated through water year 2000 data in the final SBA.

Comment 139: Define or explain the term "multiple resource outputs" on page 5 [page 7 in the final document].

Response 139: Multiple resource outputs refers to the USFS multiple use policy under which federal forest lands that make up most of the watershed are managed for timber, recreation, wildlife, watershed, and other resource outputs. The meaning of multiple resource outputs has been clarified in the text of the SBA.

Comment 140: Hecla Mining Company is not familiar with the Raymond-Carlisle Mill; mill and mines known to Hecla as the Ray Jefferson and the Carlisle, page 5 [page 7 in the final document].

Response 140: The SBA was in error on the nomenclature of the Ray Jefferson Mill site. The Carlisle Mine is the name that the remedial investigation documents ascribe to the adit. DEQ staff consulted with Hecla staff and corrected the errors in naming in the SBA.

Comment 141: On page 8 [page 11 and 12 in the final document]; all regulatory citations should be updated, page.8 [page 11 in the final document].
onward.

Response 141: This was an oversight in the change of citations as DEQ became a Department. The corrections were made in the SBA.

Comment 142: On page 9 [page 11 in the final document] the quote of the sediment narrative standard is not correct.

Response 142: There were minor errors in the quote of the standard. These errors were corrected.

Comment 143: Turbidity criteria should be clarified as below mixing zones of point sources, page 9 [page 12 in the final document].

Response 143: The standard is applicable below mixing zones; however, it is based on salmomid sight feeding requirements. Since the standard has this technical basis, it is often used to interpret the narrative sediment standards as a deleterious impacts on the beneficial use. The clarification concerning the mixing zone was supplied as a footnote as well as clarification that this benchmark can be used to interpret the narrative sediment standard.

Comment 144: Disconnect between sentences, page 12.

Response 144: The disconnected sentences were not found.

Comment 145: Legend for map [Figure 4] on page 13 [page 18 in the final document] should clarify mines and mills.

Response 145: DEQ agrees that this will give the figure greater utility. The figure was re-plotted to mark the mills.

Comment 146: First table of Appendix A is not comprehensive; map sites are missing, most dates are missing, an explanation of acronyms and units is missing.

Response 146: DEQ agrees with this assessment of the table supplied by the USGS. The table was revised.

Comment 147: Gem discharge data does not show units.

Response 147: The units are gallons per minute. This change was made in Appendix A to better clarify how the synthetic hydrograph for the adits was developed.

Comment 148: The commenter does not believe that White Pine, Ponderosa and Western Larch were selectively logged, Page 4 [page 7 in the final document], SBA .

Response 148: Selectively logged was used here in the sense that these species were taken while most others were left ("high-graded") or the rest of the stand was slashed and burned. This was typical in the early logging days according to Russell (1985). This point has been clarified in the text of the SBA.

Comment 149: The description of the magnitude of logging does not give the true picture of the logging. This is followed by a list of intensive clear cutting since 1970.

Response 149: The magnitude of logging is described in the document and certainly the road density data indicates the level of watershed entry. This part of the SBA has been beefed up to explain the logging has been extensive in the basin.

Comment 150: Fish population data located on page 18. Statements from Forest Service documents provided indicate that cutthroat trout populations have declined.

Response 150: The data in the Table 13 on page 22 [Table 14 on page 25 in the final document] support and document this view. DEQ chooses to develop its own conclusions from the data and not rely on those of other agencies.

Comment 151: Trout densities in reference streams range from 0.021 to 0.4285. Value for Independence Creek is not diminished because many sites impaired are near roads or camps. Data should be stand-alone; fish densities can be variable.

Response 151: The Independence Creek population is interpreted by DEQ to be the result of the location of the electrofished reach near the popular campground at the base of Independence Creek. We believe such interpretations to be rational. The comment ignores the general pattern of the data. Except for Beaver Creek, which has predominantly brook rather than cutthroat trout, the heavily roaded watersheds of the North Fork have fish densities an order of magnitude or two lower than all the watersheds of low road density. The comment clings to one anomalous value and ignores the clear pattern. DEQ believes the weight of evidence favors its interpretation of the fish density data.

Comment 152: Mountain whitefish (MWF) are present in the North Fork, but are broadcast fall spawners. MWF are common in the North Fork, but their population trends are unknown. MWF are present in lower densities in the North Fork than in other rivers of Idaho. Mention MWF on page 4 [page 6 in the final document]. Mention life cycle on pages 18-20 [page 23 in the final document].

Response 152: Mountain whitefish, their life cycle, and IDFG's assessment of their populations in the North Fork are included on pages 6 and 23 of the SBA.

Comment 153: West slope cutthroat trout spawning has only been documented in tributary streams to the North Fork.

Response 153: It has been clarified in the SBA that west slope cutthroat spawning has only been documented in the North Fork tributaries.

Comment 154: Available data suggests bull trout also spawn in tributary streams used by cutthroats but not as many tributaries.

Response 154: It has been clarified in the SBA that bull trout spawning has only been documented in the tributaries to the North Fork and not even in many tributaries.

Comment 155: Below Yellowdog Creek in the North Fork and Laverne Creek in the Little North Fork the harvest was changed from six west slope cutthroat trout per day to two west slope cutthroat trout per day in 2000. No west slope cutthroat trout between 6 and 16" can be harvested.

Response 155: It was noted in the SBA that the fishing harvest rules changed in 2000 and the nature of those changes.

Comment 156: It should be noted in the vegetation section (page 4) [page 6 in the final document] that red cedar was a significant component of the riparian plant communities and not its importance as long lasting LOD.

Response 156: The importance of western red cedar is acknowledged and this point was made in the vegetation section (section 2.2.1.4.). In addition, the loss of red cedar and its impact on LOD recruitment is discussed in the Riparian Forest and Large Organic Debris Removal section (2.2.2.5.6.2)(page 49), which covers impacts that are not pollutants of concern.

Comment 157: Under the discussion of sediment data it would be useful to note that some reaches of the Little North Fork are intermittent as a result of excess bed load. This is recent since 1990.

Response 157: It was noted in the sediment data section (2.3.2.3; page 21) that the Little North Fork is intermittent over some reaches as a result of bed load.

Comment 158: Fishing pressure (may be) rather than (quite likely) is responsible for low fish density data from Independence Creek near the mouth(pages18-20) [page 23-26 in the final document].

Response 158: The language was changed from "quite likely" to "may be" in the discussion of low fish density in Independence Creek.

Comment 159: Data should be reported as fish per unit area without effort. IDFG has actual population estimates from the main stems eliminating the problems of catch per unit effort (pages18-20) [pages 23-26 in the final document].

Response 159: DEQ feels this change is not advisable in the SBA where several different data sets were used for fish population data. It was changed in the sediment TMDL where electrofishing methods will be controlled by a strict protocol.

Comment 160: Discussion on vegetation alteration (page 40) [page 46 in the final document] should be expanded to cover the impacts of riparian logging and canopy removal as these have effected LOD in the streams.

Response 160: The discussion on vegetation was expanded to address riparian logging and the loss of LOD recruitment and canopy shade in section 2.3.2.5.6.2 (page 49) of the SBA.

Comment 161: Vegetation alteration of the tributary watersheds should be included with reference to loss of riparian vegetation and canopy loss.

Response 161: See response to the comment 160. This discussion was extended to the tributaries in the SBA.

Comment 162: More demonstration or discussion of the Cross and Everest data was requested.

Response 162: The Cross and Everest data presented in their 1995 paper is referenced and the key points covered in the SBA. The reader can read the referenced paper to further understand the details.

Comment 163: Include any data information on current or historic beneficial use status.

Response 163: The available data is included on the historic and current beneficial use statuses [Table 19 in the final document]. Fisheries data is included in Table 14.

Comment 164: Table 1 [Table 2 in the final document] identifies Beaver Creek as impaired for sediment while Table 13 [Table 19 in the final document] identifies it as listed for metals. Which or are both correct?

Response 164: Table 13 is now Table 19. Beaver Creek was listed for sediment in 1998. Data in the SBA and noted in Table 19 do not support the sediment listing. Nevertheless, Beaver Creek is included in the basin-wide sediment TMDL making the point moot. DEQ further found clear exceedances of trace metals standards. Beaver Creek is clearly impaired by metals as clarified in Table 19, which summarizes the results of the assessment.

Comment 165: Table 3 [Table 4 in the final document]: is confusing not including standards for domestic water supply (DWS), agricultural water supply (AWS), and special resource water (SRW) and including standards for pollutants not of concern to the SBA.

Response 165: Table 4 is designed to be a general review of all the state water quality standards that affect the most sensitive and important beneficial uses of the North Fork and most forested watersheds. Domestic and agricultural water supplies do not have specific support standards in-stream in the Idaho water quality standards. Special Resource Water is a designation addressing the applicability of point discharges. The North Fork has no point discharges. For these reasons, these beneficial uses were not included in the short synopsis table of the most germane standards. No table in a SBA can replace a full reading of the Idaho Water Quality Standards and Wastewater Treatment Requirements, and this is not the intention of Table 4.

Comment 166: The SBA (page 10) [page 13 in the final document] identifies bacterial loading from human sources. Is this point or nonpoint sources?

Response 166: The SBA is discussing potential bacterial sources on page 13. The lack of in-stream bacteria detection indicates this is not an issue.

Comment 167: North Fork at a glance indicates temperature is a pollutant of concern. It should be addressed in the SBA. Section 2.0.

Response 167: This section was in error. Temperature is not listed as a pollutant of concern for any segment of the North Fork or its tributaries. Temperature was removed from the listing of pollutants of concern in section 2.0 (page 3).

Comment 168: On page 12, 2nd paragraph [page 16 in the final document], the section outlines all high and low event monitoring for bacteria, nutrients, oil and grease and dissolved oxygen on Prichard Creek. The section should end with a recommendation that these pollutants be delisted.

Response 168: We agree with this conclusion and it is stated elsewhere in the document. It is also stated on page 16.

Comment 169: On page 12, 2nd sentence, reference should be changed to Appendix D [Appendix B in the final document].

Response 169: We agree the reference was mislabeled. It has been changed.

Comment 170: On pages 18-19 [pages 23-26 in the final document], in using the St. Joe River as a reference watershed, the fisheries response in the St. Joe should be stated in the text.

Response 170: We believe the fishery response was stated in the text. However, this was further clarified and we now show by reference that the St Joe has health fish density numbers.

Comment 171: In section 3.1.4, Loading capacity, 3rd sentence [page 57-58 in the final document], the TMDL indicates that adequate quantitative measurements of the effects of excess sediment have not been developed. This is not entirely true. The comment cites work of the European Inland Fisheries Advisory Commission on suspended sediment concentrations.

Response 171: The European Fish Commission quantitative measurements are measurements of suspended sediment. Bed load sediment is clearly identified in the SBA as the pollutant of concern. The section was clarified by inserting the words "bed load" sediment.

Comment 172: In section 3.1.4, Loading Capacity, 1st and 2nd bullets [section 3.1.4, page 57-58 in the final document], the assumption used in this TMDL is that natural background is assumed to support beneficial uses, and that 80% above background is likely to support beneficial uses. The assumptions conflict with earlier assessment where Washington Forest Practices Board is cited: 50-100% above background is chronically detectable sediment and 100% above background is water quality violation. To resolve the problem the TMDL goal should be placed at background as shown in Table 17.

Response 172: The 80% was a typographical error and should have been 50%. The 80% was corrected to 50%.

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